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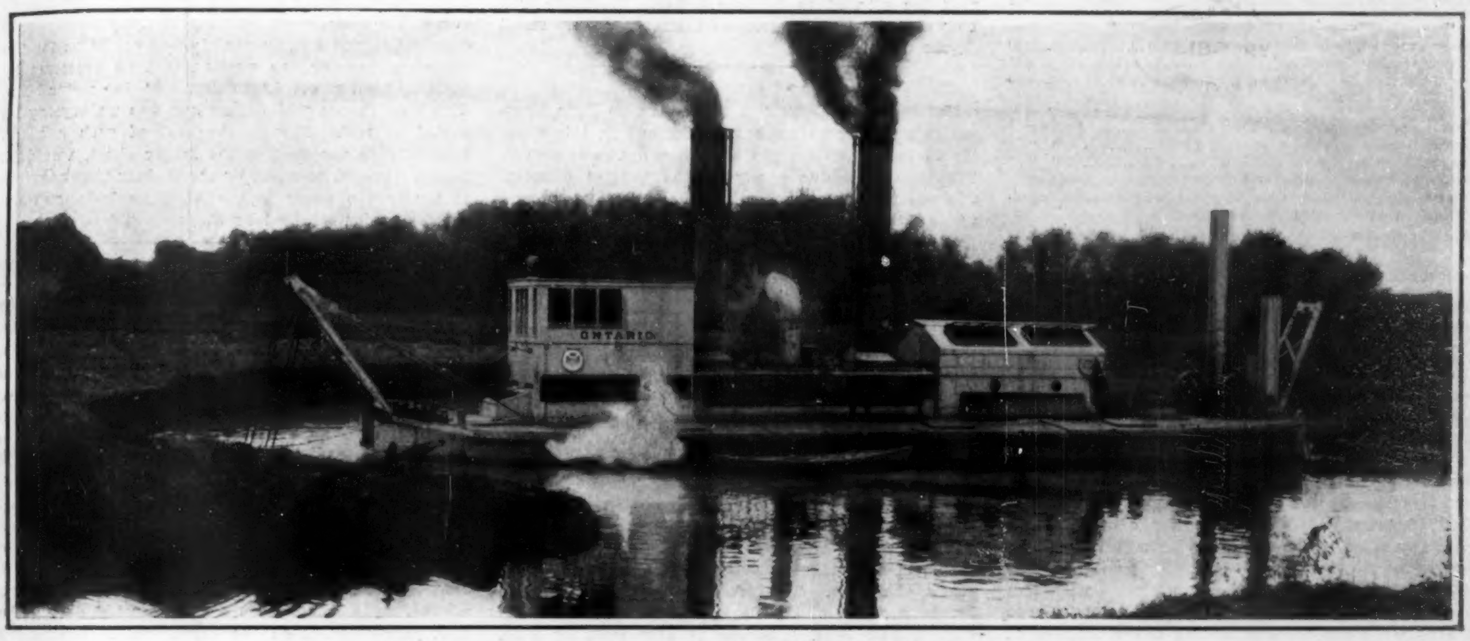
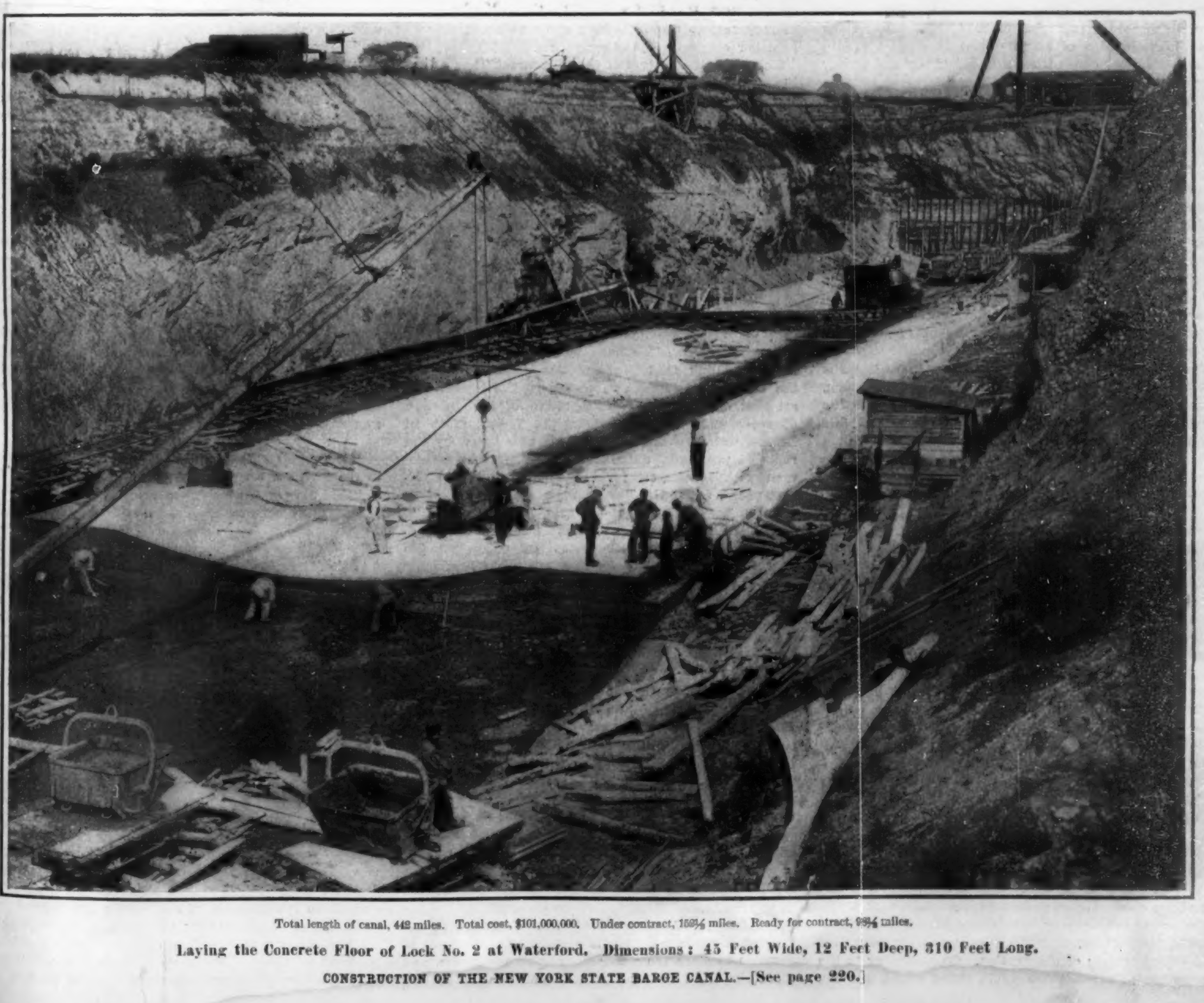


Of the total excavation of 113¼ million cubic yards to be removed, 58 million will be taken out by dredging.

One of the Powerful Hydraulic Dredges in Operation.



Total length of canal, 442 miles. Total cost, $101,000,000. Under contract, 152½ miles. Ready for contract, 98¾ miles.

Laying the Concrete Floor of Lock No. 2 at Waterford. Dimensions: 45 Feet Wide, 12 Feet Deep, 310 Feet Long.

CONSTRUCTION OF THE NEW YORK STATE BARGE CANAL.—[See page 220.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, OCTOBER 3, 1908.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE NAVAL AEROPLANE.

In spite of the final wrecking of his machine, the results achieved by Wright in the army tests at Fort Myer have proved so convincing, that one of the Navy Department bureaus is seriously investigating the question of their usefulness for scouting on the high seas. At the first blush, the proposal to transfer the aeroplane from the land to the sea will seem to many people to be a mere multiplication of the many and serious risks attending the operations of the aeroplane on land. "How will the machine start?" it will be asked. "How make a landing?" "And how will its half ton of weight be supported when it is afloat?" On considering the problem a little more closely, however, it begins to be evident that so far as the difficulties of starting and landing, etc., are concerned, they can, with a little ingenuity and proper design, be so far overcome, that the aeroplane may be, at least in the present stage of the art, handled more easily, and with less peril to the navigator, than it is under present conditions.

The navy is so far of this belief, that Lieut. George G. Sweet, of the Bureau of Equipment, is, we understand, working on the plans of a naval aeroplane, designed to be carried by our warships and co-operate with them in naval maneuvers. The changes which would be necessary to transform a military into a naval aeroplane are not by any means radical, and involve merely the substitution, for the present skids or runners of the Wright machine, or the bicycle wheels used by the Farman type, of some form of boat-like structure, possessing sufficient displacement to carry the weight of the aeroplane. Although the Lieutenant naturally is not making public his plans at this time, it is fairly certain that a pair of long, narrow, and finely-modeled hulls, attached below the machine, will be substituted for the present wheels or runners. These must necessarily weigh more than the Wright brothers' skids; but they need not be so very much heavier than the cumbersome wheels and framing of the French machines. When we remember that although the racing skiff used in sculling races weighs only 25 to 27 pounds, it is capable of carrying an oarsman weighing 200 pounds, it would seem to be quite practicable to build two shells weighing but little more than the carrying equipment of a land aeroplane, each capable of carrying half the weight of the machine, or say 500 pounds. Compared with the difficulties of starting on land, the naval aeroplane would be at a distinct advantage. Our battleships are capable of making from 18 to 20 miles, and our cruisers from 23 to 30 miles an hour. This last is the speed of our fast scout cruisers of the "Salem" class; and it would be more than sufficient to enable the Wright machine to rise into the air and commence its flight. In practice, the aeroplane, furnished with its pair of shells, would be placed upon the fore deck, and the ship turned head to wind. When the speed of the ship through the air approached the proper velocity, the aeroplane engines would be started, and the machine would leave the vessel at a height of from 20 to 30 feet above the sea. The aerial scout, rising high into the air, would command a vast field of observation, and possessing a speed nearly double that of the warship, it could, upon discovering the enemy, quickly pass over him for purposes of observation. On returning to the parent ship, the machine would swing round into the wind and come down gradually until it rested on its shells, when it could be towed alongside and taken on board by a boat crane.

It is not denied that in carrying out these operations, serious difficulties might be encountered. For the present, at least, and until the aeroplane has been greatly improved in stability, power, and ease of handling, it would be impossible to make any such flight as above described in rough weather; but in calm weather, and even in moderate breezes with an easy sea, we can see no reason why it should not be accomplished. We are moving fast in these days, and the wonderful flights of the Wright brothers have so far established confidence in aeroplane flight, that the attempt to produce a naval aeroplane will be watched with the greatest interest, and no small degree of optimism.

YACHT RACING IN 1908.

Not for many years has there been so little interest in yachting as we have witnessed in this country during the season which has now drawn to a close. This has been due partly to the general financial depression of the earlier months of the year, and not a little to the growing popularity of the motor boat and the gas-driven cruiser. In Great Britain, on the other hand, the season has been marked by some very fine racing, particularly in what is known as the 23-meter class, made up of four fine boats of about 70-foot waterline measurement, designed under the new rule which aims to produce a yacht free from the exaggerations of form and sail plan which characterized the racing yachts built under the old waterline length and sail area rule. The first of this quartette was the "Nyria," which made her appearance in 1906, and by her good performance proved that it is possible to combine high speed with good seagoing qualities. In 1907 two yachts, the "White Heather" and "Brynhild," were built to meet the "Nyria;" and in a season's racing the "White Heather," a Fife boat, had no difficulty in beating the previous year's champion. The present season was marked by the entrance of Sir Thomas Lipton into the class with a new boat, "Shamrock," also built by Fife. She has proved to be a most consistent performer throughout the season, winning, out of thirty-five starts, nineteen first and two second prizes. In light weather the "Shamrock" proved to be unbeatable; and in moderate to strong breezes she was about able to hold her own with the other yachts.

Naturally, the success of the "Shamrock" has raised the question of another race for the "America" cup, and it is not unlikely that a challenge will be sent over this autumn, asking for a race under the new rule adopted a few years ago by the New York Yacht Club. This rule is approximately similar to that under which the British 70-footers have been racing this year. It was drawn up with a view to eliminating the broad and shallow body, deep keel, and enormous sail spread, which characterized the later boats built as challengers and defenders of the much-coveted trophy; and there is a strong feeling in the New York Yacht Club that future races should be held under this rule. The latest announcement by the Cup Committee, however, was in favor of holding future races under the old rule, on the ground that it produced a faster, if less serviceable, vessel; the committee holding that the intention of the donor of the cup was to have it raced for by the fastest vessel that could be built, irrespective of the question of seaworthiness. Interest in the 70-foot class in British waters next year has been stimulated by the reported placing of an order by an American yachtsman with Herreshoff for the construction of a 70-foot yacht, under the British rule, which will be sent over to try conclusions with the British quartette. If this boat is built, it will afford an excellent opportunity to prove whether Herreshoff can show the same superiority under the new as he has invariably done under the old rule.

WATER STORAGE DESTROYS THE TYPHOID BACILLUS.

It has been known for some years that the storage of water, undisturbed, has a beneficial effect in reducing the number of bacteria with which it may be infected. The question has recently been made the subject of extensive laboratory tests by Dr. A. C. Houston, Director of Water Examination, Metropolitan Water Board, London. Eighteen separate portions of water were infected with from forty to eight million typhoid bacilli, and bacterial counts were made, every week, until the typhoid germs had entirely disappeared. In one of the series of tests, ten of the portions of water failed to show any bacteria at the end of three weeks, sixteen at the end of four weeks, and in five weeks' time the whole of the eighteen portions failed to show any signs of the deadly germ.

The bearing of these laboratory tests upon the question of city water supply is evident; for where it is possible to store the water in suitable reservoirs, and maintain it in an undisturbed condition for a few weeks before drawing off, the city using that water is provided with an additional safeguard against the greatly-dreaded disease. On the other hand, Dr. Houston does not consider that undisturbed storage should be allowed to take the place of filtration.

The latter has proved to be a most effective safeguard against typhoid, and storage should be looked upon rather as an additional protection, not as excluding the necessity for sand-bed filters. It is suggested that the time and expense of purifying a city's water supply might be reduced by using special storage reservoirs in combination with mechanical filtration at a specially rapid rate; and Dr. Houston expresses himself as being satisfied with a well-stored rapidly-filtered water, rather than an unstored slowly-filtered water. The difficulty of maintaining a sufficiently large quantity of water in an undisturbed condition for the necessary four or five weeks might be overcome by building such reservoirs in duplicate, the water being drawn off in one while the other was undergoing its period of rest. Though the cost of such a plant, especially in the case of the larger cities, would be heavy, it would be offset by the shorter time required to purify the water in the filtration beds, and the greater purity obtained by the twofold treatment.

PROGRESS ON PANAMA AND ERIE CANALS COMPARED.

Public attention has been so strongly centered upon the progress of the Panama Canal, that the people of this State, and particularly of New York city, have failed to realize either the magnitude of the work involved in the reconstruction of the Erie Canal, or the extensive scale upon which the work is now being prosecuted. A comparison of the total quantities taken out on the two canals, during the years they have been in course of construction, shows that the State enterprise is quite comparable, in the magnitude of its operations, with that now being carried on by the Federal authorities. Active construction commenced on the Panama Canal in 1904 and on the Erie barge canal in 1905. During the first year of work at Panama, 243,472 cubic yards were taken out; while 716,676 cubic yards were excavated during the first year of work on the barge canal. During the second year's work, 1,799,227 cubic yards were taken out at Panama, and 1,460,705 cubic yards from the barge canal. During the third year of work, the totals were respectively 4,948,497 cubic yards and 4,500,459 cubic yards. In the fourth year, 15,764,098 cubic yards were removed at Panama. As 1908 was the fourth year of work on the Erie barge canal, the totals, of course, cannot as yet be given; but in July the total excavation was 1,067,111 cubic yards, or 99 per cent of the amount taken out at Panama for July, 1907, which was 1,076,767 cubic yards. In August of this year the total excavation was 1,091,891 cubic yards, as compared with 1,271,966 cubic yards taken out at Panama during August of last year. In this comparison the important point should not be overlooked that the New York State enterprise contains in its 442 miles of length a much larger number of structures compared to the amount of excavation than does the Panama Canal, the excavation of the Erie barge canal representing only forty per cent of the total cost of the work. In both of these enterprises the seeming delay in starting the work of active construction was due to the enormous amount of preparatory work in the prosecution of surveys, preparation of plans and estimates, and the purchase and placing on the ground of the enormous plant and supplies.

Attempts recently made to map out weather charts of the high sea between Europe and the United States are said to have proved entirely successful. Some preliminary experiments commenced last year, not specially prepared, had led to some practical results in so far as the weather bulletins received from passing steamers allowed weather charts and weather prognoses to be established on the ocean. The more systematic experiments undertaken this year by Dr. Polis, director of the Aix-la-Chapelle metereological observatory, in conjunction with the Hamburg-American Line on their steamship "Kaiserin Auguste Victoria," have been prepared carefully, telegrams relating to the weather condition on the coast of Europe being transmitted daily by wireless telegraphy from the observatory above mentioned to the steamship on its way to New York throughout its voyage. If the American and European governments and other authorities lend sufficient aid, the missing link between the weather records of the two continents, viz., those of the Atlantic Ocean, will be completed in the near future, allowing the weather conditions from the western boundary of the United States to the eastern boundary of Europe to be surveyed daily. This would doubtless mean an extraordinary advance in connection with weather prediction (which in the interests of agriculture has lately been promoted most actively by the German government), while yielding a most welcome aid to navigation. The progress of those experiments is accordingly watched with the keenest interest in German naval circles.

THE HEAVENS IN OCTOBER.

BY HENRY NORRIS RUSSELL, PH.D.

A bright telescopic comet, with a long tail, was discovered photographically by Prof. Morehouse on the evening of September 1. Its orbit has now been approximately calculated, and it appears that at the time of discovery it was rapidly approaching both the earth and the sun, and consequently increasing in brightness. On September 15 it was about half way between δ Cassiopeiæ and the Pole Star, and was distinctly visible with a field glass. It is moving westward, almost parallel to the Milky Way, and on October 1 will be a little north of the star β Cephei, after which it will continue to move in the same direction, nearly toward Vega.

Its orbit is such that it will not come within 100 million miles of the sun, or much nearer to us, but it will doubtless be visible with a field glass, and perhaps to the naked eye throughout October, though it cannot be called conspicuous, as was Daniel's comet of last year.

It is unusual for a comet at such a distance from the sun to have so conspicuous a tail. Perhaps this means that the comet contains more than usual of the very fine particles which are repelled by the presence of the sun's light, and form the tail (as explained here some months ago). But this is rather a matter of speculation. If the comet came near the sun, it would probably be a fine object; but unless the approximate orbit deduced from the first three observations is very far wrong, this will not be the case; and if we wish to see a strikingly conspicuous one, we will probably have to wait till Halley's comet comes round in the spring of 1910.

THE HEAVENS.

We may begin our identification of the constellations this month with the great square of Pegasus, which is high up in the southeast. It is so large, and the four stars at its corners are so bright and so nearly equal (all being of about the second magnitude), that it is one of the easiest figures in the sky to recognize.

Though called the great square of Pegasus, one of its corners is really in Andromeda, as our map shows. The ownership of this star (if we may so speak) was once somewhat in doubt, for some authorities formerly called it Delta Pegasi, thus depriving Andromeda of her brightest jewel. Now the question has been settled in favor of the lady, and all star catalogues refer to Alpherat as Alpha Andromedæ. Evidence of the dispute remains, however, for the next brightest star belonging to Pegasus (which lies half way between the lower edge of the square and Altair) is not lettered Delta, but Epsilon, as if it was the fifth star in order of brightness in the constellation, and the fainter stars follow down the Greek alphabet after this, leaving Delta out altogether.

Before we leave the subject, it may be remarked that α Andromedæ is shown by the spectroscope to have a dark companion, revolving about it in a highly eccentric orbit, in a period of about 100 days.

The eastern edge of the great square, carried far southward, comes upon an isolated bright star. This is Fomalhaut, in the constellation of the Southern Fish—one of the most isolated stars in the heavens. Below this is the southern constellation Grus (the Crane), which though containing some bright stars, never rises high enough above our horizon to be conspicuous.

In the southeast is another lonely star, almost as bright as Fomalhaut. This is Beta Ceti, which although it bears the second letter of the alphabet, is the brightest star of its constellation. Cetus is one of the few cases where the Greek letters seem to have been scattered over a constellation almost regardless of the brightness of the stars.

The other prominent stars of Cetus are shown on the map. The remarkable variable Mira, which bears the letter o, is now near its maximum brightness, and visible to the naked eye. Two years ago it was of the second magnitude, and for a few days the brightest star in the constellation. Last year it was hardly more than one-quarter as bright. It will be of interest to see how it behaves this time.

In the intervals between the maximum it sinks below the ninth magnitude, that is, to only 1/1000 of its greatest brightness.

Of the zodiacal constellations which lie above those just described, only Sagittarius, setting in the southwest, and Taurus, just rising, are conspicuous, though Aries contains one star of the second magnitude, and Pisces is now enlivened by the presence of the planet Saturn. Along the Milky Way is the familiar sequence of fine groups: Auriga low in the northeast, then Perseus, Cassiopeia, Cepheus, Cygnus, and Aquila, with Lyra below Cygnus in the northwest. Hercules and Corona, with parts of Ophiuchus and Boötes, fill the western sky. The Great Bear is below the pole, and the Little Bear and the Dragon are above it.

THE PLANETS.

Mercury is evening star until the 28th, when he passes through inferior conjunction, and becomes a morning star. On the 4th he is at his greatest elongation, 25 deg. from the sun, but, being far south, is not well visible in our latitude.

Venus is morning star, rising about 2:30 A. M. on the 1st and 3:10 on the 31st, and is exceedingly conspicuous.

Mars is also morning star, but is still pretty near the sun. Toward the end of the month he rises about 4:30 A. M.

Jupiter is also a morning star. Early on the morning of the 13th he is in conjunction with Venus, the two planets being less than a degree apart. This gives the amateur who is enterprising enough to get up early an opportunity to see the two planets in one telescopic field, and compare their apparent size and brightness.

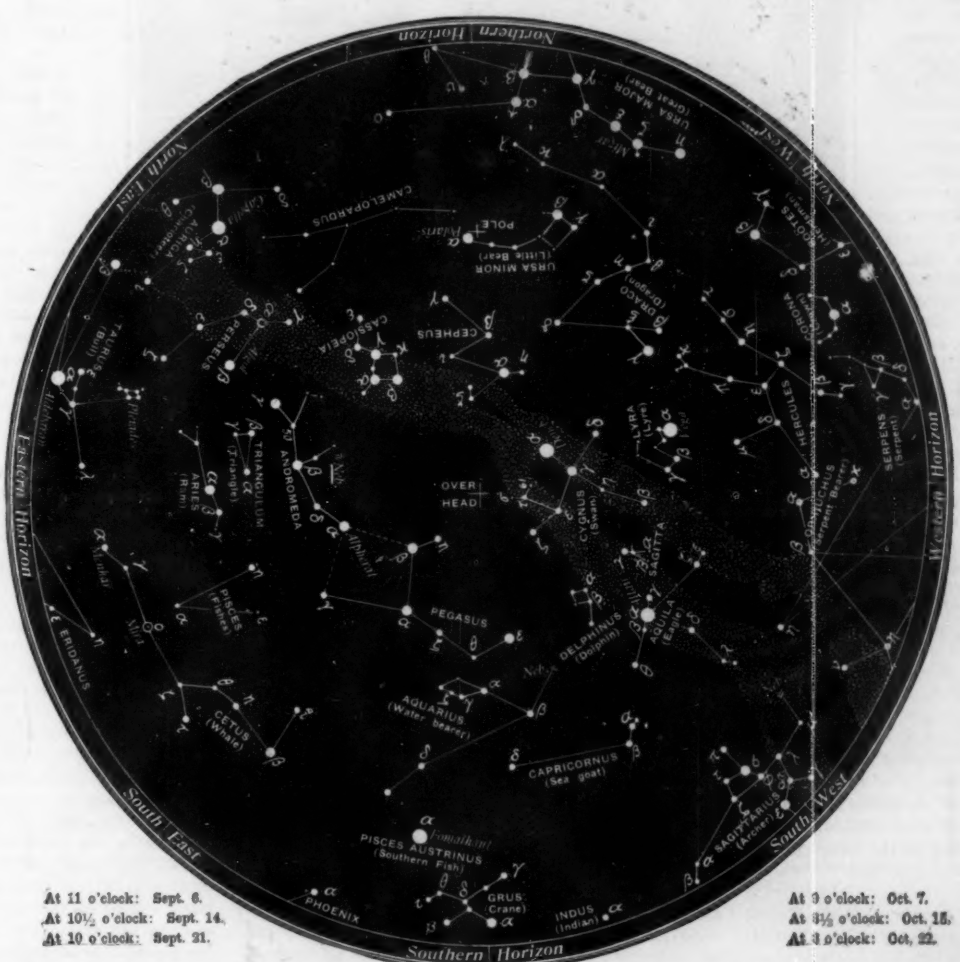
Saturn has just passed opposition, and is observable all night. Uranus is in quadrature on the 6th, and comes to the meridian at 6 P. M. Neptune is almost exactly opposite him, and when he is in quadrature on the 10th, he is due south at 6 A. M.

THE MOON.

First quarter occurs at 1 A. M. on the 3d, full moon at 4 P. M. on the 9th, last quarter at 10 P. M. on the 16th, and new moon at 2 A. M. on the 25th. The moon is nearest us on the 7th, and farthest off on the 19th. As her closest approach, or perigee, is near the time of full moon, we may expect unusually high spring tides, as was the case last month for the same reason.

The moon is in conjunction with Uranus on the 3d, Saturn on the 8th, Neptune on the 16th, Jupiter on the 20th, Venus on the 21st, Mars on the 23d, Mercury on the 25th, and Uranus again on the 30th.

Princeton University Observatory.



At 11 o'clock: Sept. 6.
At 10½ o'clock: Sept. 14.
At 10 o'clock: Sept. 21.
At 9½ o'clock: September 29.
At 9 o'clock: Oct. 7.
At 8½ o'clock: Oct. 15.
At 8 o'clock: Oct. 22.

NIGHT SKY: SEPTEMBER AND OCTOBER

THE LINER "CLEVELAND" LAUNCHED.

At the shipyard of Blohm & Voss, Hamburg, Germany, there was launched on September 22 the steamship "Cleveland," the latest ocean leviathan of the Hamburg-American Line.

The "Cleveland" is a sister ship to the "Cincinnati," which was launched in July. These vessels of about 18,000 tons are destined for the service between New York, England, and the Continent, which they will enter in the spring of 1909.

In type they are similar to the well-known "Amerika" and "Kaiserin Auguste Victoria," although not quite as large. In the first cabin, accommodating not over 300 passengers, a notable feature is the large number of staterooms for the sole use of one passenger as well as the splendid suites.

The dining room on the upper deck will be equipped with small tables seating two, four, and six persons, a recent innovation which has become immensely popular.

Other public rooms are the spacious lounge, music room, writing room, smoking room, as well as the gymnasium with electrical apparatus. Sheltered corners, making it agreeable to be out of doors during all weathers, have been provided on both the spacious promenade decks. In addition to the above-named feature there will be an electric elevator, electric-light bath, a dark room for photographers, a bookstall, library, information bureau, etc.

The second cabin accommodates 350 passengers, and will contain the finest accommodations and conveniences ever offered in a transatlantic passenger steamer; the same applies to the third-class and steerage passengers.

The following are the principal dimensions of the vessels: Their length is 600 feet, beam 65 feet, and height from waterline to upper deck 55 feet. They are built of steel, provided with five decks and a double bottom extending the entire length of the ship divided into numerous water-tight compartments. As these ships will also carry large cargoes of freight, they have been provided with facilities which will enable them to load and discharge the freight very expeditiously. The ships have four masts with twenty-four derrick booms. For the safety of the vessel all the latest appliances have been provided: An automatic hydraulic system for closing the water-tight doors separating the eleven water-tight compartments into which the hull is subdivided, automatic fire extinguishers, intercommunicating telephones, submarine signal system, wireless telegraphy. The speed will be about 16 knots.

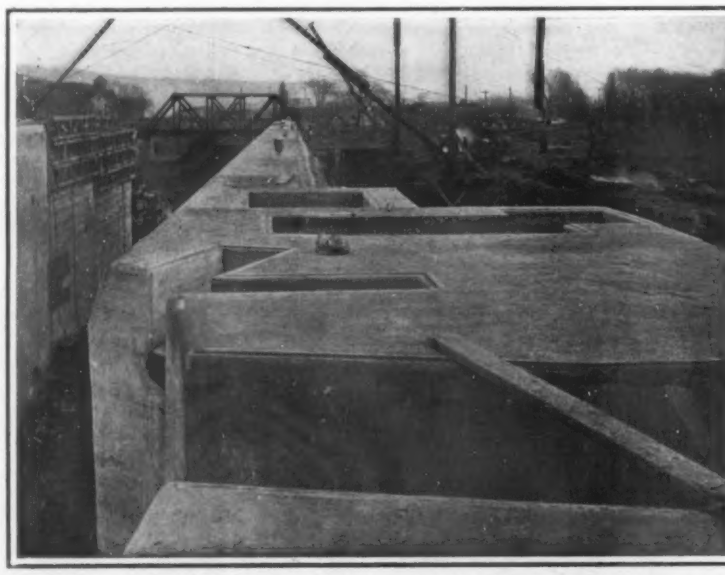
A MOTOR-CAR LOCK IS WANTED.

A motor-car lock which will be simple and thief-proof would be an invention which would appeal to motorists just now, and the wonder is that some such device has not already been included in the regular equipment of some make of car. It may be true that in some cities the removal of the starting crank or a spark plug or some other part of the mechanism is a guard against theft, but thieves are too often graduates of factories and carry a few handy tools along with them. Several instances have occurred of late in which the thief has supplied the spark plug himself. In one day the Detroit police received news of six thefts of motor cars. Three of the cars were discovered that evening.—Motor Age.

THE NEW YORK STATE BARGE CANAL.

Nature has provided two natural outlets from the Great Lakes to the Atlantic, one by way of the St. Lawrence River, and the other through the Mohawk and Hudson valleys. The first presents the great natural obstruction of the Niagara Falls; the second is intercepted by a range of hills and mountains, broken by a low depression at the junction of the Mohawk with the Hudson. As far back as the days of the Indian occupation, the Mohawk and Hudson valleys formed the main line of communication for the various tribes, and, with the coming of the white races, the importance of this route was emphasized, the tide of pioneer advance flowing steadily up the Hudson and Mohawk valleys to spread out ultimately on the prairies of the then Far West. As this route of travel grew in importance, it was utilized by every means of conveyance known to those early days, from the canoe and the packhorse to the lumbering stage coach. Ultimately, and inevitably, the government found itself confronted with the demand for improved means of transit; and as far back as 1793 the improvement of facilities for transit by water were begun by the construction at Little Falls of a canal about 3½ feet in depth by three-quarters of a mile in length containing five locks, which served to carry the water-borne traffic around the rapids. Shortly afterward similar improvements were undertaken at Rome and other places, and finally, in response to the rapidly increasing demands of traffic, the government undertook the construction of the Erie Canal, extending from the Hudson River near Albany to Buffalo—a really stupendous work for that early day. The canal was opened in the year 1825. It was 4 feet deep, its least width on the bottom was 28 feet, and its total length was 363 miles. It contained 83 locks and 18 aqueducts, the total cost of the work being about $7,000,000. Between the years 1836 and 1862 the canal was enlarged to a depth of 7 feet, and a least width on the bottom of 52 feet. The total number of locks was reduced from 83 to 72 and their size was increased from 15 feet by 90 feet to 18 feet by 110 feet. The total cost of the work was $32,000,000.

Meanwhile the railroad system of the country was developing by leaps and bounds, and entering into keen competition with the waterway. The steady decrease in railroad rates, coupled with the shorter time of transit, was bound to tell heavily in their favor; and there was a steady transfer of traffic from the old to the new system of transportation. Practically no effort was made by the State authorities to meet this competition, and there was a constant heavy fall in the total amount of traffic, which decreased from a maximum 4,600,000 tons in 1880 to 2,000,000 tons in 1904. The only serious effort to alter conditions was the abolishing in 1882 of the tolls on the canal, which had amounted in the sixty years from 1820 to 1882, to a total of $120,700,000. In spite of the encouragement afforded by this step, it failed to win back the traffic from the railroads. In 1895 an inadequate attempt was made to rehabilitate the fortunes of the canal by an appropriation of $9,000,000 for reconstruction; but this amount was quite inadequate to enable work to be undertaken on a scale of any magnitude. In 1903 it was decided to put the question of reconstruction to the vote of the people, who by a large majority authorized the expenditure of $101,000,000 in the enlargement of the canal. The new plans called for a least depth of 12 feet and a least bottom width of 75 feet, dimensions which will accommodate barges of 1,000 tons capacity. The locks were to be 28 feet in width, with a depth of 11 feet on the sill. Subsequently, and very wisely, the locks, in anticipation of a future widening of the canal prism, were increased to 45 feet width and 12 feet depth over the sill. With a view to this possible enlargement, the present embankments are being built so as to make it possible to widen the canal with as little expense as possible to 110 feet; and in canalizing the rivers, the channels are being dredged to a width of 200 feet.



The successive openings will contain the machinery for opening and shutting the gate; the gate anchorage; the machinery for filling and emptying valves; and the capstan machinery.

Upper End of Dock Wall.

The new canal, on leaving Lake Erie at Buffalo at an elevation of 565.6 feet above sea level, follows the Niagara River to Tonawanda Creek, and thence runs in an easterly direction, and generally parallel with the shore line of Lake Ontario, until the Oswego River is entered, from which point it continues in a generally easterly direction to a junction with the Hudson River at Waterford. After entering Tonawanda Creek, it follows the course of this stream until, at Lockport, it descends by a flight of two locks whose lift will vary from 49 to 54 feet, the lift being dependent upon the level of Lake Erie. From Lockport to Rochester the canal extends for a distance of 60 miles in a single level, crossing the Genesee River before reaching the city. At the Genesee River, harbor accommodation will be afforded by means of a pool formed in the river. Beyond Rochester the new canal coincides with the old canal until it enters the River Clyde near Lyons. Up to this point, the location of the old and new canals is practically identical; but beyond Lyons the old canal route is abandoned, and the new location has been laid so as to take advantage of the various river channels encountered, the change of location carrying the new canal as much as 20 miles to the north of the old work. The Clyde River is followed to the Seneca River, which, in its turn, will be utilized as far as Three Rivers, where the Seneca and Oneida unite to form the Oswego River. At this point, a new stretch of canal will be formed in the bed of the Oswego River, north to Lake Ontario, the depth of the river being increased by the use of fixed dams. From Oswego River the canal continues easterly, following the Oneida River, to Oneida Lake, through which it passes, leaving the easterly end of the lake through the valley of Wood Creek, through which it is located to the city of Rome. At Rome the canal is carried by locks and across the divide, and enters the valley of the Mohawk River.

In the valley of the Mohawk between Utica and Schenectady, the canal will be provided with nine movable and two fixed dams. Eight of the movable dams will be of the bridge-and-gate type. They will have a maximum lift of 15 feet, and a maximum depth on the sills of 20 feet. By the use of these dams it will be possible to control the high floods to which the Mohawk is subjected, and operate the canal with as little inconvenience to the thickly-settled valley as possible. In order to avoid the big drop in elevation, which occurs at the discharge of the Mohawk into the Hudson River, the location of the new canal has been changed so as to enter the Hudson at Waterford by a series of five locks, in which the canal is brought down from an elevation of plus 151 feet to tide level. At Waterford the important branch known as the Champlain Canal starts north to its connection with the lake. From Waterford to Fort Edward the location will lie in the Hudson River, and the new route will take the place of the old land line located along the base of the foothills. Beyond Fort Edward, also, the line will be on a new location, and its final entry into Lake Champlain will be through Wood Creek, which will be canalized by the use of fixed dams. In this connection it is interesting to note that the Canadian government has prepared plans for the construction of a 12-foot depth of water along the present route, from the mouth of the new canal through Lake Champlain to Montreal.

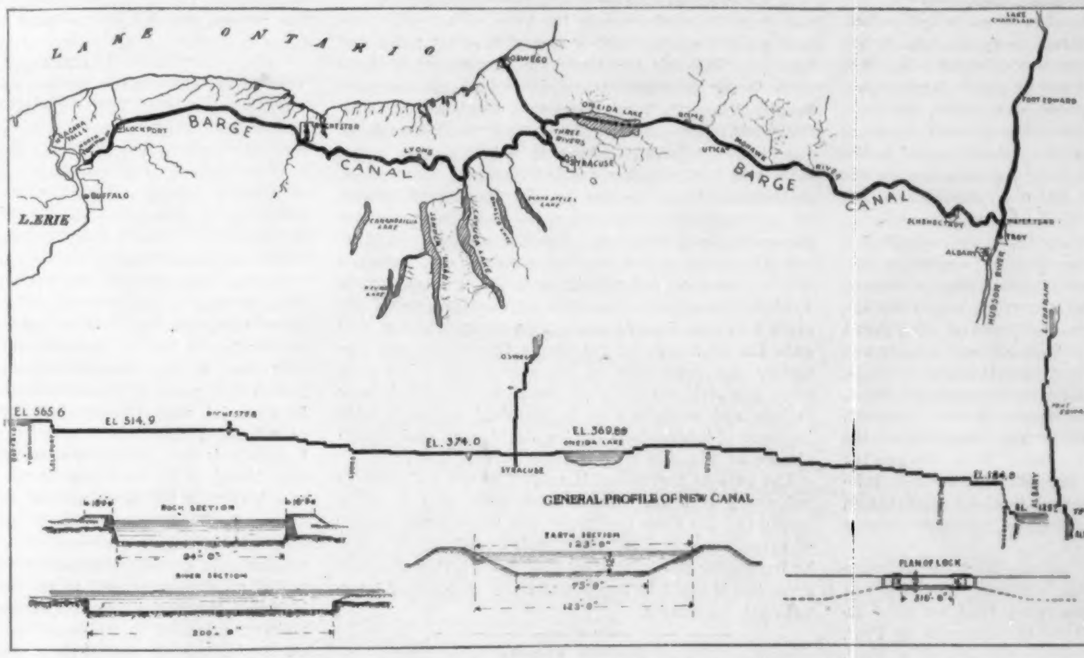
An important feature, which should be remembered in judging of the magnitude of the work being done, is that the mere excavation represents but forty per cent of the total cost of the canal; the other sixty per cent covers the unusually large amount of constructional work, in the way of fixed and movable dams, locks, bridges, and other masonry and steel work. Thus, there will be a total number of no less than fifty-four locks, whose lift will vary from 6 feet to a maximum of 40½ feet; and of these, thirty-four will be built along the line of the Erie Canal proper. As showing the improved character of the new canal, it should be mentioned that on the present Erie Canal there are no less than seventy-two locks. All of the locks will be 45 feet in width, with a workable length of from 300 to 310 feet, according to the character of the boats. Throughout the canal the masonry will be of concrete, composed of 1 part of Portland cement

This Cantilever Excavating Machine Spans the Entire Width of the Canal.

The Bucket Grab of Machine Shown in Adjoining Cut.

THE NEW YORK STATE BARGE CANAL.

and from 7½ to 9 parts broken stone, gravel, etc. All lock gates will be built of steel; and they will be operated by electric motors, the power being generally developed by turbo-generator plants located at the locks. For the control of rivers and streams and the impounding of water for summit supply, thirty-five dams will be required, of both the fixed and movable types. The statement of the total amount of excavation and construction to be executed gives an impressive idea of the magnitude of the work.



Plan, Profile, and Sections of the New York State Barge Canal.

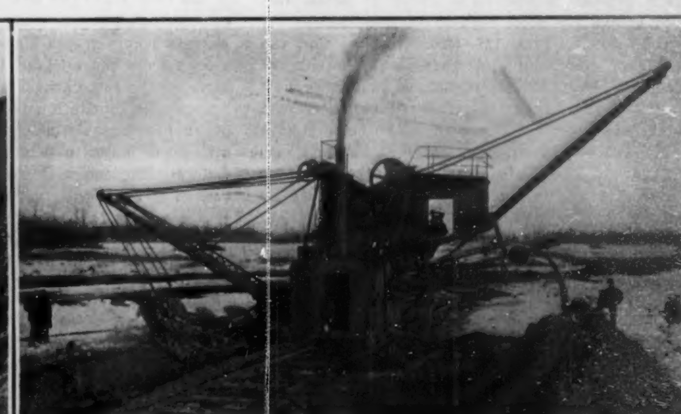
QUANTITIES OF EXCAVATION AND CONSTRUCTION FOR NEW YORK STATE BARGE CANAL.

Dredging	57,676,700	cubic yards.
Earth excavation	54,989,000	" "
Rock excavation	10,806,000	" "
Embankment and back filling.	9,454,300	" "
	132,927,000	" "
Concrete	4,243,105	" "
Cut stone	9,787	cubic yards.
Iron and steel	82,500	tons.
Sawed timber	93,756,000	feet B.M.
Piling and round timber	4,230,000	lineal feet.
Rip-rap	1,628,967	cubic yards.
Number of locks	54	
Number of dams	35	
Total length of canal	442	miles.
Total estimated cost	$101,000,000	

Active construction of the canal was commenced over three years ago, but on account of the extended surveys, comparative studies, and preparation of contract drawings, the work could not be attacked on any considerable scale until the present year. On the first of August contracts had been made to the total amount of $26,265,158, covering 152½ miles of canal; and on the same date, plans had been completed covering an additional amount of 98¼ miles of canal and a large storage reservoir, which represented an estimated cost of $11,760,612. Work on the canal is now in full swing; the total excavation on all contracts during July amounting to 1,067,111 cubic yards, which is 99 per cent of the amount taken out at Panama for July, 1907.

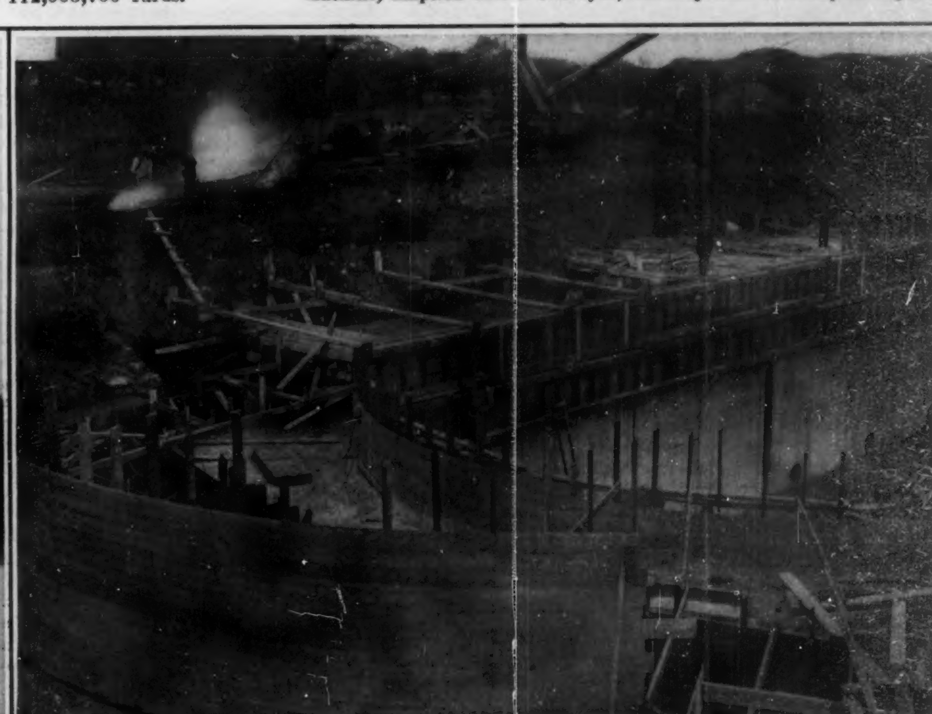
Air-pump displacement should be one-seventy-fifth of the low-pressure piston displacement on a compound engine.

Section of Canal Excavated in Soft Material. The Material Dredged Out and the Earth Excavation Amount to on the Whole Canal 112,665,700 Yards.



Lubecker Excavator. The Material is Dug from the Left-Hand Side of Machine, Emptied onto a Conveyer, and Deposited in Dump at Right.

Lobnitz Rock Breaker. Operated by Lifting and Letting Fall the 15-Ton Iron Hammer Seen Below the Derrick.



Constructing the Concrete Walls of No. 2 Lock at Waterford. This Will be One of a Series of Five Locks.

THE NEW YORK STATE BARGE CANAL.

The Sixth Tuberculosis Congress.

If there be any gatherings of more merit and endowed with more beneficent influence in shaping the future of our race than even peace congresses, they are the series of congresses on hygiene and demography, and principally those on tuberculosis, which have met during the last two decades. The present Congress on Tuberculosis now convened in this country is the sixth of its kind. It has never been surpassed in the wealth of material offered, and its deliberations will give a vast impetus to the great work of eradicating a terrible plague. Some idea of the magnitude of this Sixth International Congress and its exposition and our own share in fighting consumption may be gleaned from the fact that of the 438 contributors to the exposition, 312 reside within the limits of the United States; 126 without. Two hundred and twenty-two of the number are collective contributions, that is, from associations, societies and other corporate bodies, and 216 from individual members of the Congress. Of the 222 collective contributors, those from the United States number 170; those from Europe or from other parts of America, 52. Of the 216 individual exhibits we are indebted to the United States for 142; to European and American countries outside of the United States, for 74.

The economical necessity of stamping out tuberculosis and thereby increasing national efficiency can not be more graphically presented than by condensing the able paper prepared for the Congress by Prof. Irving Fisher of Yale University. According to Prof. Fisher, tuberculosis costs, in hard cash, over one billion dollars a year. Consumption kills 138,000 every year in the United States. This is equal to the deaths from typhoid fever, scarlet fever, diphtheria, appendicitis, meningitis, diabetes, smallpox, and cancer all put together. The scourge picks out its victims when they are young men and young women, at the very time they are beginning to earn money. The minimum cost of such items as doctors' bills, medicines, nursing and loss of earnings before death amounts to over $2,400 in each case, while the earning power which "might have been" if death had not come brings the total cost to at least $8,000. If this is multiplied by the 138,000 deaths, we find the cost is bigger than the almost incalculable sum of $1,000,000,000. Prof. Fisher estimates that over half of this cost generally falls on the luckless victim himself, but the cost to others than the consumptive is over $440,000,000 a year. As a matter of self-defense it would be worth while to the community, in order to save merely a quarter of the lives now lost by consumption, to invest $5,500,000,000. At present only a fraction of one per cent of this money is being used to fight the disease. Five million people now living in the United States are doomed to fill consumptives' graves unless something is done to save them. As each death means anxiety and grief for a whole family, Prof. Fisher estimated that there will be over 20,000,000 persons rendered miserable by these deaths.

Government control of some kind seems an obvious necessity. In this country we are hampered by the constitutional requirement of respecting State rights. As Dr. H. M. Bracken pointed out to the Congress, there are interstate regulations relating to the shipping of hogs, cattle, and commercial products, but when the question of national legislation for the protection of human beings is raised, the question of States rights is brought forward and the proposed legislative measure is promptly killed. In a recent article Dr. C. Harrington drew attention to the remarkable difference which may exist under conditions fundamentally alike, in the matter of States rights, citing as illustrations the fact that while States rights prevented legislation for national quarantine covering a period of about a century, no strong objections were made to the passage of national laws relating to pure food, packing house products, etc. The question of States rights is easily thrust aside when it interferes with interstate commercial problems—another illustration of the greater value of the dollar than of human life. This very Congress has reserved a whole section to the consideration of State and municipal control of tuberculosis, and of laws and ordinances relating to it. The time is approaching when the people will insist upon having their health safeguarded. We have in this country a cabinet with special members for law, for war, for the navy, for foreign politics, for internal political and economic improvements. We have a special department for agriculture, which supplies the people with rare and common seeds, and prevents and cures the diseases of their cattle. We even begin to make an end to our dereliction in allowing our forests to be burned or stolen. We have, however, no central representation of the forces that make for the physical welfare of the people, and no United States board of health. Above all, the poorer classes should be enlightened on the dangers of consumption, a subject which Sherman C. Kingsley brought to the attention of the Congress. He showed that the necessities of life exhaust the earnings of a man earning from nine to eighteen dollars a week, leaving no margin for emergencies. A call from the doctor means the price of a day's wages and a cut from the rent or the savings for shoes and clothing. For this and many similar reasons tuberculosis is far advanced when discovered among these people. The only hope of recovery depends upon early diagnosis. They live in the least favorable parts of the city, in tenement houses, in neighborhoods where milk and food supplies are inferior. In a recent examination of 150 families by Dr. Theodore B. Sachs, 25 to 30 per cent of all the children in these families showed signs of infection. The disease forces children out of school at the earliest possible age, exhausts family resources and vitality and fastens itself on the weakened members. The obvious needs suggested are more hospitals for advanced cases—hospitals that will gain the confidence of the people themselves and also satisfy the conscience of the community. We need more sanatoria for incipient cases, more funds to save fathers and mothers still in incipient stages, a wide increase of tuberculosis clinics, day camps, and church classes as adjuncts to the home care of patients.

The present movement is guided by the endeavor to put every personal consideration aside, and to bring before the Congress the newer and more recent means of grappling with the tuberculosis question. It would be impossible not to express gratification that the Congress has brought to our shores many who are of international reputation.

Encke's Comet.

Encke's comet was reported from the Cape Town Observatory on May 28 last, about one month later than the time calculated by Prof. Backlynd. The discrepancy is easily accounted for by the perturbations which the body naturally undergoes as it travels among the planets. Next to Halley's comet, which will probably be photographically picked up in a month, and which will reach perihelion in 1910, Encke's comet is the most famous body of its kind. In the first place, it is periodical, and therefore belongs to a class numbering comparatively few comets. In the second place it has been made the subject of as much mathematical calculation as Halley's comet itself. As it now appears, Encke's comet seems dismembered, the tail being separated from the nucleus. It is rarely that any comet presents the same aspect twice in succession, for which reason this mutilation is not extraordinary. On some of its previous visits it has appeared almost tailless; on others it was a perfect comet of its kind. Unfortunately, the comet is south of the equator, for which reason it cannot be very well observed by many observatories of the world.

Funeral of Lieut. Selfridge.

Lieut. Thomas E. Selfridge, the promising young army officer who fell to his death with Orville Wright in the latter's aeroplane on September 17, was buried with military honors in the Arlington National Cemetery, which adjoins Fort Myer, on the 25th ultimo. The loss of this brilliant officer will be keenly felt, particularly in aeronautic circles, for he was thoroughly informed in the new science, and, as the secretary of the Aerial Experiment Association, he had had much to do with the development of aeronautics in America. The various aeroplanes built by this association, all of which flew successfully, were designed by him, and the third of these, the "June Bug," on July 4 last won for the first time the Scientific American Trophy. Lieut. Selfridge is the first martyr to flight by a self-propelled heavier-than-air flying machine, and it seems but fitting that a suitable monument should be erected on the spot where he fell.

Mr. Orville Wright is slowly recovering from the injuries he sustained in the fall of the aeroplane. His broken thigh is slowly knitting, and his ultimate recovery is only a matter of time.

Melting Silica.

A German firm has brought out a new process for melting silica and for molding it in various forms, using the principle of the electric furnace. The silica (quartz, etc.) is fused in a special type of furnace, and to this end it is placed in a carbon tube which is mounted horizontally or vertically as desired. This tube forms one of the electrodes of the furnace, and it is inserted in a larger tube which is used as the second electrode. In the space between the tubes is placed carbon powder or other conducting substance. One end of the inner tube is closed by a removable stopper. The outside of the large tube is closed by a cover which has such shape that it can be inserted more or less in the melted matter of the inner tube. A suitable housing of firebrick incloses the whole. The current is passed between the two carbon pieces and the heat causes the melting of the silica in the best manner. When the silica is entirely fused it can be taken from the mold in the form of a solid block. On the other hand it can be molded by using an inner core which is placed inside the above-mentioned tube, so as to compress the silica within the latter. Steam or compressed air can be used to give the needed pressure for the molding process. At the conclusion of the process the end of the mold is removed and the silica is driven out by means of the movable piece.

Wilbur Wright's Latest Aeroplane Records in France.

On September 21, only four days after the accident to Orville Wright's aeroplane at Fort Myer, his brother, Wilbur Wright, surpassed all previous records by remaining in the air 1 hour, 31 minutes, and 20 seconds, during which he flew 98 kilometers (60.85 miles) in a circular course above the military field at Auvours. The average height of the aeroplane above the ground during this flight was about 25 feet, though at times Mr. Wright sent it up to an elevation three or four times as great. The machine flew with great steadiness, and only alighted at the starting point when it became too dark for the aviator to see. The start of this record-breaking flight (which surpassed that made by Orville Wright by 16 minutes and 56 seconds) was delayed until afternoon on account of a brisk breeze. At 4 P. M. three unsuccessful attempts to launch the machine were made. The trouble was found to be that one of the rollers of the car which carries the aeroplane on the starting rail was damaged. This was repaired, and at the next attempt the machine was started readily. A large and enthusiastic crowd witnessed this flight, which dispelled all doubts abroad as to the complete practicability of the Wright aeroplane and the possibility of making extended flights with it. A few days later, on September 24, Mr. Wright demonstrated that he could fly in an 18-mile wind. He remained aloft 54 minutes and 35 seconds, and flew a distance of 39 kilometers (24.21 miles) in a circular course. When the aeroplane turned into the wind it slowed down perceptibly, while when it flew with the wind it traveled very fast. The following morning a flight of 36 minutes and 14 seconds duration was accomplished. After fitting division partitions in the new large gasoline tank in order to check the movement of the fuel from one end of the tank to the other (which tended to affect the equilibrium), Mr. Wright made a 5-minute test flight. This was followed by a 9-minute 1-second flight with M. Paul Zens as passenger, which was but 5 seconds shorter than the record one made by Orville Wright at Fort Myer when he carried Major Squier as passenger.

The Current Supplement.

The current Supplement, No. 1709, opens with an article by our English correspondent on some highly interesting discoveries which afford conclusive evidence of a connecting link between the Greek art and the art of the Far East. Dr. Francis Darwin's striking paper on the movement of plants is continued. Prof. Harold Jacoby explains popularly the meaning of gravitation. Armor-bearing animals are described and illustrated. Inventors will read with interest some striking statistics on occupational mortality, which tend to show how much the inventor can do to ameliorate conditions in the factory and workshop. Dr. W. Donsell contributes an article on the preparation of tobacco. Very few people have ever heard of Count Francisco Zambeccari, yet he was the Zeppelin of his day. In the Scientific American Supplement will be found a description of his dirigible airship which sailed the air in the early part of the nineteenth century. A new gas locomotive embodying some novel features in its construction is described and illustrated. One of the latest developments in the application of armored concrete is the construction of poles and masts for the support of telephone and telegraph lines. An excellent article describes their manufacture. Wilson E. Symons writes on the future of the electric locomotive. The measurement of ocean waves is the subject of an article by J. B. Van Brussel, in which he describes a method of measuring waves, a method based on comparative measurements of spectroscopic photographs. A primer of wood preservation is presented by W. F. Sherfesee. The usual electrical notes and trade notes and formulæ will be found in their accustomed places.

Visitors to California will have access to a third forest of giant redwoods when the counties of Tulare and Fresno complete construction of twenty-five miles of highway between Visalia and Redwood Canyon, in the Kings River country, where there is a grove of over fifteen thousand magnificent specimens of the *Sequoia gigantea*, many of which are said to compare in size and beauty with the trees of the Mariposa and Calaveras groups. It is probable that the property, which is as yet untouched by lumbermen, will be recommended to Congress for purchase as a national park. One tree in the redwood grove, recently measured by a government ranger, is 110 feet in circumference and is estimated to contain 800,000 feet of lumber. A claim is made that a fallen giant in the region is the largest in the country. Located at an altitude of less than six thousand feet, the canyon would be accessible for a longer period than the other giant groves in the State.

Correspondence.

Prevention of Street Noises.

To the Editor of the SCIENTIFIC AMERICAN:

Your article in this week's issue on "The Street Noise Crusade and the Rail Joint" is very good on this cause of unnecessary street noises. By far the most noise is produced, to my mind, by the wheels on the cobble stones. If flat rails about five inches wide to admit of the different width axles were laid, making two tracks in every stone-paved street, the loads would be drawn much easier and faster by the horses. The noise would be greatly lessened, and the nervous system of mankind thereby incalculably benefited. The animals' endurance would be enhanced and business much more quickly handled. The expense would be more than compensated in various ways.

FRED. BRADLEE ABBOT.

Sharon, Mass., September 4, 1908.

Wreck of the White Mountain Express.

To the Editor of the SCIENTIFIC AMERICAN:

I read the above-named article in a recent issue of your valuable paper with much interest.

As you state, the train was hauled by a double-header. You give as a cause of the wreck the heavy lateral swaying motion of the electric locomotives that were hauling the train. I am of the same opinion so far, but furthermore believe that the main cause was the double-header. If a single engine had been used I don't think it would have occurred; and if it had been as heavy as both of those together, for a simple reason.

If the forward engine of a double-header strikes a depression, say in the left-hand rail, it will be thrown to the left, and after passing the place will sway to the right just in time to meet the second engine swaying to the left for the above reason. This will cause a heavy twisting motion upon the engine trucks, and tends to spread the rails, which it doubtless does when the locomotives weigh 95 tons and run nearly 60 miles an hour.

W. MITTENDORF.

New Braunfels, Tex.

Absorption of Amido Bodies from the Soil.

To the Editor of the SCIENTIFIC AMERICAN:

I notice in the issue of SCIENTIFIC AMERICAN of August 15, 1908, page 111, an article in regard to the absorption of carbon from the soil, and especially the utilization of amido bodies. In this connection permit me to call your attention to the fact that in 1897 I published an article referring to the same subject. This article was published in Die Landwirtschaftlichen Versuchs-Stationen, vol. xlix, 1897, page 193, and in the Journal of the American Chemical Society, vol. xix, No. 8, August, 1897, page 605.

The complete data show that oats grown in soils rich in humus contain about 25 per cent more nitrogen than those which are grown upon ordinary agricultural soils, and that this increase in nitrogen is due directly to the absorption of amido bodies from the soil. Naturally, the whole of the amido body would be more or less completely utilized, and thus carbon as well as nitrogen would be assimilated by the plant therefrom.

J. W. WILEY.

Washington, D. C., September 10, 1908.

Science, Enunciation, and the Schoolboy Mind.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 22 the article entitled "Science and the Schoolboy Mind" calls attention to the tendency of trusting to oral instruction in schools and the risks thereto. I would state that a great deal of the fault is not in oral instruction itself, but in the manner in which it is given. The tendency of the average teacher is to talk rapidly in explaining a lesson and, if I may say it, carelessly. This does not mean the use of improper grammatical English, but the improper enunciation thereof.

If, to quote the article, a pupil had heard the teacher say in a purely syllabic way the definition of the equator, the ridiculous interpretation of it as "a menagerie lion" would not and could not result.

In speaking syllabically the syllables are fully sounded, and a sufficient pause made between each, so as to prevent a blending together of the final and initial sounds. The length of this pause need not necessarily be more than a fraction of a second. Too much stress cannot be laid upon the matter of correct speech, the lack of which is the cause of the errors stated. Teachers should be instructed especially in the great importance of correct speech, and especially in the classroom. In fact, proper enunciation of speech should be a *sine qua non* in the examination of teachers.

In syllabic speech a misconception of a word is impossible to the pupil's mind, because each sound is clearly enunciated and time given for it to make the desired impression on the pupil's mind. In rapid unsyllabic speech, the words are transmitted from the teacher to the pupil in such a way that there is a confusion of sound, and a false impression is made upon the pupil's mind that can be removed only after a great deal of trouble. One can easily prove it by reading both the statement that "the equator is an imaginary line" and that "the equator is a menagerie lion" in a pure syllabic style; or better, read the statement both syllabically and unsyllabically. The difference will be such that no further proof is necessary. In fact, too great a stress cannot be laid upon this matter, which is so important and yet so utterly neglected.

GERALD ELLIS CRONIN.

Brooklyn, N. Y., August 30, 1908.

Air Scouts and Artificial Fog.

To the Editor of the SCIENTIFIC AMERICAN:

A great deal is being said and written of late concerning the influence the airship will exercise on modern warfare. Heretofore strategy, the doing of things not expected by the enemy, the execution of secret movements for which he is not prepared, has been the very soul of military science. But with the advent of the "air scout," we are told, all this will be changed; every general will know just what his opponent is up to, the man with the big army will win.

It seems to me that this view of the matter overlooks some important possibilities. When the "air scout" becomes an accomplished fact, will not some inventive person devise an artificial fogmaker, a kind of bomb that will, in exploding, fill the air with smoke, so that the aerial spy will be foiled? Something of the sort will surely happen. A general about to execute a flank movement, or a concentration on some given point in the enemy's line, could make his preparations over night, and then, after having filled the upper air with smoke by means of balloons loaded with the smoke-producing mixture, deliver the blow as he designed it. And his foe would have no other way of ascertaining his intention than the good old method of observation and deduction.

In a recent story H. G. Wells depicts a fancied battle between a fleet of American battleships and a German air fleet, in which the Germans get the best of the fight by dropping bombs on top of the unlucky vessels. Now, the latest type of British cruiser, the "Indomitable," I understand, is without rigging. Why could a ship of war not be equipped with a bomb-proof, or at least a bomb-shedding, roof? This device would explode the deadly missile in the air, away from the vitals of the ship, and thus save her from destruction. Or perhaps the roof could assume the form of a network, which would be lighter, and would not catch the wind.

In fine, although the introduction of air scouts and bomb-dropping aeroplanes will complicate matters, I do not believe they will revolutionize warfare, as has been alleged. Possibility has always a few trumps up her capacious sleeve, which she can produce when needed.

SYDNEY C. HALEY.

Eustis, Fla., September 12, 1908.

The Value of Inclined Propellers for Helicopters.

To the Editor of the SCIENTIFIC AMERICAN:

I desire through your columns to bring to the attention of aeronauts an experiment which may possibly throw a little light on the problem of aerial navigation by means of the helicopter type of machine.

Experiment shows that the simplest form of helicopter, the propeller with flat inclined planes, cannot exert sufficient lifting force to raise the weight of the engine with any additional weight. Although the efficiency of the helicopter can be very much increased by varying the shape of the planes, so far no form has been devised which gives any great promise of success.

The failure of the helicopter is due to the fact that a large proportion of the power of the engine is wasted in creating lateral air currents, which have no effect in raising the machine. That an engine can exert more than power enough to raise itself, if the power were effectively applied, has been demonstrated by Prof. Langley's inclined plane experiment, and Nature itself affords a demonstration in the flight of the bird, which, weight for weight, possesses only a small fraction of the energy of a well-constructed engine. The problem of flight by means of the helicopter is therefore as much a question of properly utilizing the power of the engine as of combining the greatest power with the smallest weight.

The experiment referred to, although performed with crude apparatus, illustrates this truth in a significant manner. Two propellers of equal size with flat inclined planes were revolved horizontally at the same rate of speed and their lifting force measured by a spring scale. The speed was then doubled and the lifting force again measured. It was found that the lifting force had only been increased by half. As the speed was still further increased, the proportionate increase in lifting power diminished, which indicated that as the speed increased the energy wasted in creating lateral currents increased. This is the secret of the failure of this form of helicopter.

The propellers were now inclined toward each other at an angle of about 35 deg. and revolved at the same rate of speed. It was found that at lower speeds the lifting power was about the same as in the horizontal position, but at higher speeds it was very much greater. The significant fact of the experiment is that, with the propellers inclined, the lifting force increased at a greater rate than the speed, while the reverse was the case with the propellers in a horizontal position. The reason for this is that the air currents created by each propeller impinge upon the blades of the other and thus, by mutually increasing the resistance they encounter, enable them to exert a greater lifting force. The angle at which the propellers should be inclined for the greatest efficiency would of course be the angle that gives the greatest upward component of force.

If the principle illustrated in the above experiment were more fully recognized in the construction of the helicopter type of machine, better results might be attained.

H. T. KEATING.

Columbus, Ohio, September 9, 1908.

The New California Rifled Oil Pipe.

The $4,500,000 rifled pipe line spanning the 282 miles from Bakersfield to Port Costa with its relay pumping station every twenty-three miles, its sixty men on duty along the route and its flow of between 17,000 and 20,000 barrels of thick, heavy oil past a given point every twenty-four hours, is now in operation.

The construction of the pipe line was started just a year ago. The idea was the joint invention of John D. Isaacs, consulting engineer at Chicago of the Southern Pacific Company, and Buckner Speed.

The rifled pipe is a new scheme. It has been described at some length in the SCIENTIFIC AMERICAN. Into the interior surface of the pipe are cut corrugations about an eighth of an inch deep, and these run spirally round and round, making a complete circuit every ten feet. Into this rifled pipe from two separate engines are pumped nine parts of the heavy oil and one part of water. The water following the rifled indentures takes a swirling movement and forms a very thin sheet of lubricant about the oil, and the two move along together, the oil forming a dark central core that does not come into direct contact with the pipe. This avoids friction, which, with such oil, would prevent progress. It also saves the life of the pipe.

At each pumping station on this rifled-pipe line there are two 55,000-barrel oil tanks and one 10,000-barrel water tank. The flowing oil and its surrounding sheet of water are received into one of the big duplicate tanks and then the water is drained off from the bottom and again taken up by a duplicate water pump and shot into the big pipe into which oil is being sent from a duplicate oil pumping engine.

Smokeless Fuel.

According to the Mechanical Engineer a London man has recently patented the following process for the manufacture of smokeless fuel: About one-third part by weight of wet peat and two-thirds part by weight of bituminous coal, which may be in a finely divided state, are taken and placed in a retort and heated to a temperature sufficiently high (about 850 deg. Fah.) to drive off those hydrocarbons that produce smoke, the generation of the steam from the peat assisting in this operation. It will be understood that the temperature is not raised materially higher than is necessary to drive off the hydrocarbons as stated. The heat is applied for about five hours. The bituminous coal binds the peat together to a coherent mass and forms a fuel of high calorific value, which is readily ignited in a grate in the ordinary way and burns economically and without smoke.

In practice the retort may be provided with relief valves and arranged so as to maintain a pressure of 10 pounds per square inch. The retort may be heated in any convenient way, such as by heat externally applied or by burning some of the gases generated after partial purification.

The watery extract, containing tar of complex constitution, pyroligneous acid, and other products derived from the carbonization of peat, in addition to the gases referred to, is advantageously condensed and utilized for the production of a pitch of superior quality, and the usual condensable products obtained from the bituminous coal in the retort may be collected and used for any desired purpose. In some cases the contents of the retort after the process has been completed may, while still hot or after they have cooled, be discharged into a solution of calcium chloride. By this means the smokeless fuel is rendered slightly deliquescent and always retains a certain quantity of moisture. The coal or the peat or both may be moistened with a solution of calcium chloride before being placed in the retort.

Surface condensers require 1½ to 2 square feet of cooling surface per engine horse-power.

THE PRICE OF WATER.

While we fully recognize the importance of water as an indispensable condition of life, we seldom realize what quantities of it exist in our daily food, or what high prices we have to pay for it in the ordinary course of our purchases in shop or market. Take, for instance, the butcher's bill, which is usually the most serious item of domestic expenditure. It is a trifle disconcerting to be told that when the thrifty housewife expends money upon the best cuts of beef, no less than three-quarters of the sum is paid for water. Yet such is unquestionably the case—vouched for by the highest analytical authorities. Uncooked beef or mutton contains exactly 75 per cent (or three-fourths of its whole bulk) of water.

Other kinds of meat are less fluid in their nature. Lamb, for example, contains only 64 per cent of water. Pork has still less, the amount varying from 50 to 60 per cent. But those who buy smoked bacon really purchase the greatest amount of solid satisfaction for their money, for this meat seldom contains more than 22 per cent of water.

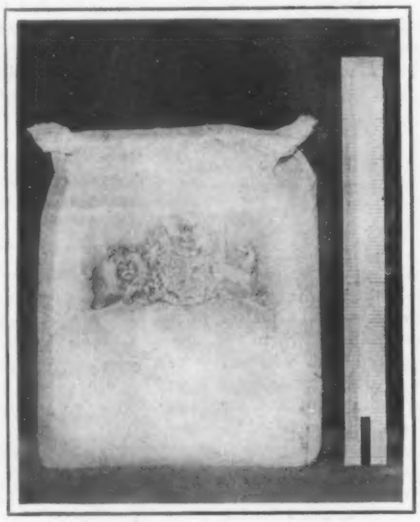
In the fatty parts of food, hydrogen and oxygen do not exist in the chemical proportions necessary for the formation of water. Therefore, it may be laid down as a general rule that the more fat or oily the meat, the less water will it contain. This fact, the diminution of water as fat increases, is well exemplified in the case of poultry. The flesh of pigeons contains 75 per cent of water, that of fowls and ducks 70 per cent, while a fat goose may have as little as 38 per cent of water in its composition.

The flesh of different sorts of fish varies considerably in the quantity of water which it contains, the figures ranging between 40 and 80 per cent. Most of the kinds commonly seen upon the fish dealer's slab approximate to the higher rate. Thus, the flesh of eels contains 75 per cent of water; that of salmon and other red-fleshed varieties, about 77 per cent; while white fish, such as soles and turbots, reach one per cent higher still.

Milk must be regarded as the type of a complete food. Yet milk, fresh from the cow, and before it has paid a visit to the nearest pump or tap, contains between 86 and 88 per cent of water. This fact is exceedingly significant of the importance which Nature attaches to water as a diluent of her food substances. But certain so-called solid foods contain even more water than the same weight of milk. This seems a paradoxical statement, yet it is perfectly true. Examples of the kind are especially common among our kitchen vegetables.

For instance, the turnip contains water to the extent of nearly 90 per cent, while very nearly the same proportion goes to the "make-up" of a cabbage. But it is a still greater surprise to learn that cucumbers, vegetable marrows, and pumpkins are only 5 per cent removed from water itself, chemically speaking. Nineteen-twentieths of this substance is water, suspended, as it were, in a frail network of solid matter. This brings to light the extraordinary fact that a cucumber—an object with which a fairly effective blow might be dealt—has from 7 to 9 per cent more water in its composition than the milk which we drink out of a glass!

It is quite impossible to determine the amount of water in any substance, and thus arrive at the price which we have to pay for it, without careful analysis. Guessing is valueless, for appearances are more than usually deceptive in this particular branch of chemical study. This fact is well shown in the case of fruit. Whereas the hard, dense-fleshed apple contains from 80 to 82 per cent of water, and the comparatively solid-looking strawberry 90 per cent, the most luscious grapes yield only 80 per cent of water when subjected to the analytical process.



Wheaten Flour Contains About 12 Per Cent of Water.

Strawberries Contain 90 Per Cent of Water.

Foods which contain only a small percentage of water are usually unfit for human consumption until they have been cooked. The culinary art, reduced to its simplest terms, consists mainly in innumerable devices for putting water to food in an attractive manner. Bread is a capital case in point. Dry wheaten flour contains, as a rule, about 12 per cent of water; and dry wheaten flour would be voted anything but a satisfactory article of food by the majority. Bread, on the other hand, is the acknowledged staff of life. In this, its changed form, the flour has received an addition of water until the percentage has risen to from 45 to 50. This increase of moisture has brought about important chemical changes, which have converted the dry and uninviting flour into a pleasant and easily digested food.

At the same time, it is occasionally possible, after adding water to food in the cooking process, finally to evaporate it again with excellent results. This we do in the case of biscuits, which seldom contain more than 8 per cent of water when they come from the oven—that is, some four per cent less than the original flour. From these facts we begin to realize that Nature does not really cheat us when she makes us pay a premium on water when we think we are buying food. A large quantity of water is necessary not only to render food palatable, but also to make it at all edible. Speaking broadly, all dry food is indigestible food; and thus water is seen to play a part in our dietary far more important than is at first evident. Chemical change under an absolutely dry condition is impossible; and with equal certainty it may be said that if the stomach is deprived of its due allowance of water necessary for the digestion of any particular food, it fails in its work.

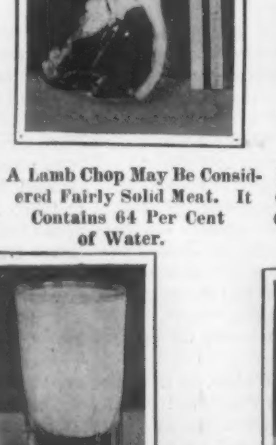
TABLE-TOP PHOTOGRAPHY.

BY PERCY COLLINS.

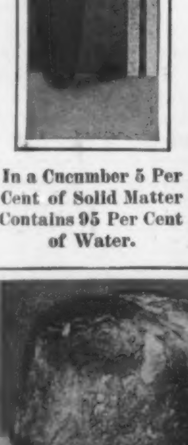
The well-known saying that the "camera never lies" has nowadays become somewhat limited in its possible application—to say the least. In the early days of dry-plate photography, the phrase was no doubt strictly true in its widest sense. But nowadays, as everyone knows, the camera can and does perpetrate on occasion the most flagrant falsehoods. Of course this is true, to an extent, in the case of ordinary photography, when the artist is perfectly straightforward in his intentions, and merely desires to select the best point of view for his picture. In this way it may be said that almost any back yard or piece of waste land will yield a pretty but absolutely untruthful "peep," if only the right spot for setting up the camera be chosen. All around may be grim and ugly, but by dint of a little judicious selection, a little clever "touching," and possibly with the aid of a "cloud negative," the photographer turns out a picture of real beauty.

But in this article it is the writer's intention to deal briefly with a more obvious phase of deceptive photography. Everyone knows something about "faked" photographs, and is aware that the depravity of the camera may often be turned to good account, and made to supply a number of pictures, both curious and beautiful, for the photographer's album. Table-top photography, however, is quite a novel craze, to which few people as yet have paid much attention. Indeed, it is quite on the cards that many of my readers may have heard nothing about it whatever. A few words by way of introduction will therefore be desirable.

Table-top photography may be justly described as an art; for no inconsiderable amount of skill and ingenuity must be called forth if the results are to repay the trouble which must be taken. Briefly, the

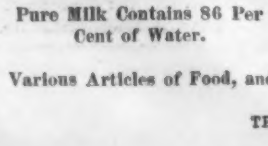


A Lamb Chop May Be Considered Fairly Solid Meat. It Contains 64 Per Cent of Water.

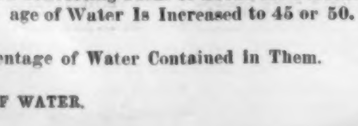


In a Cucumber 5 Per Cent of Solid Matter Contains 95 Per Cent of Water.

The Solid Apple Contains 80 Per Cent of Water.



Pure Milk Contains 86 Per Cent of Water.

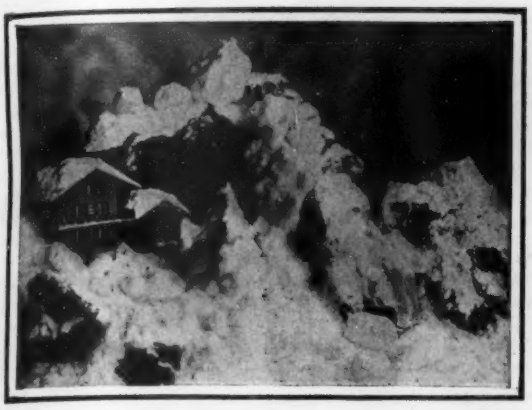


In Converting Flour to Bread the Percentage of Water Is Increased to 45 or 50.

Potatoes Are Among the Vegetables Containing the Least Water.

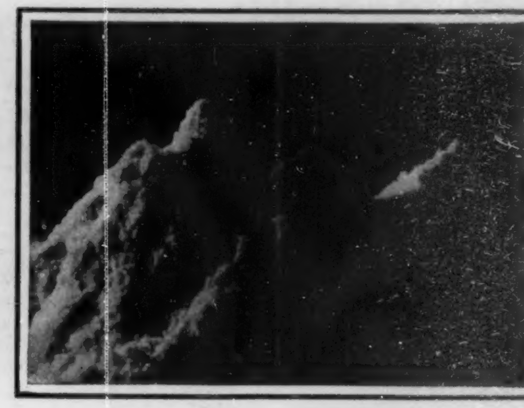
Various Articles of Food, and the Percentage of Water Contained in Them.

THE PRICE OF WATER.

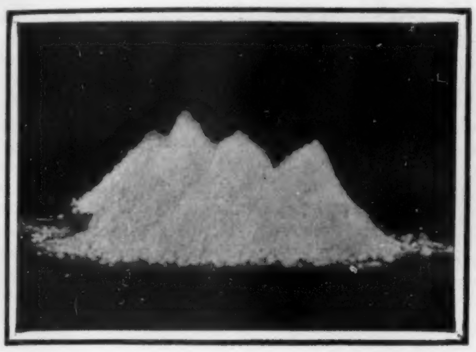


"A Scene in Switzerland."

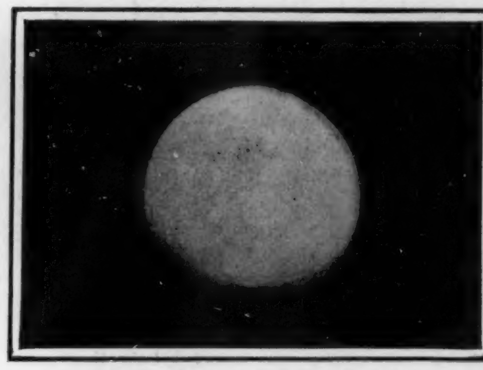
A Winter Scene.



"Sunrise on the Mountains."

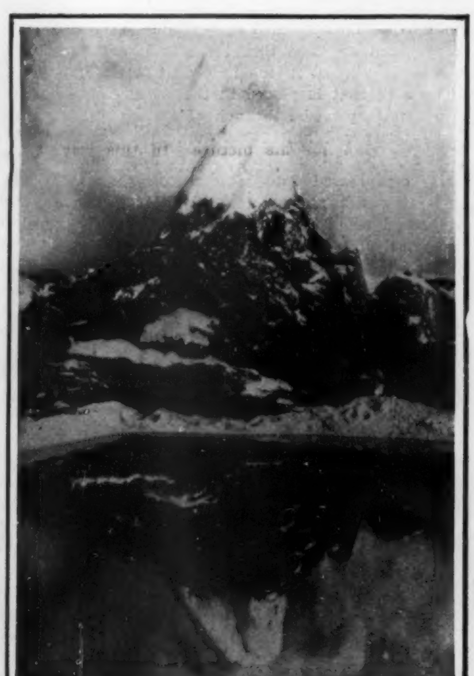


Powdered Alum Arranged for the Sunrise Scene.

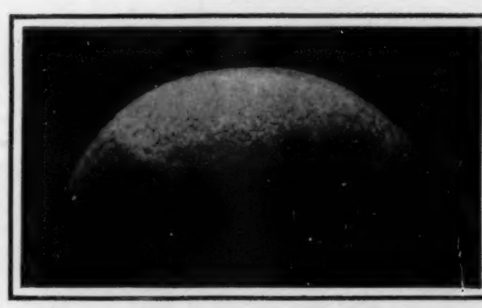


Tennis Ball Arranged for the "Young Moon" Photograph Below.

The Mountain Top. The Clouds Are of Cotton Batting Hung Out of Focus.



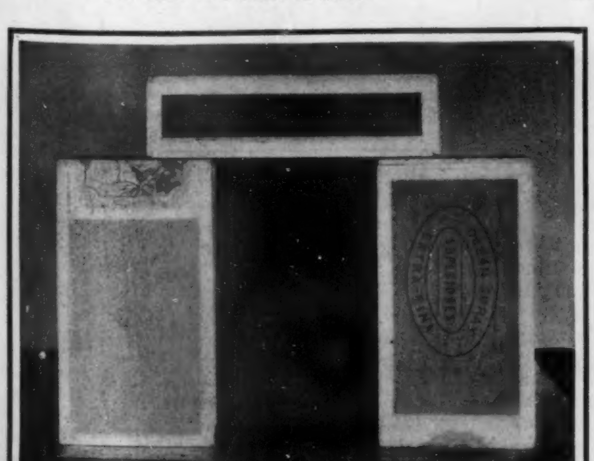
"A Mountain Lake." Note the Cloud Effect. The Lake Is a Plate of Glass.



Photograph of the Young Moon.

Lumps of Wax and a Paper Ship on a Looking Glass Make an Excellent Iceberg Scene.

An Alpine Peak Made of Coal Lumps Dusted with Alum to Produce Snow Effects.



Smoked Glass Supported by Boxes to Produce a "Faked" Lightning Flash Photo.

A "Fake" Lightning Flash.

How the Camera and Settings Are Arranged for Table-Top Photography.

TABLE-TOP PHOTOGRAPHY.

idea is to obtain negatives of mimic scenery, etc., which has been previously built up from any materials that may suggest themselves as suitable. The annexed photograph will give the reader some idea of the necessary preparations. At *A* we have a movable background, upon which paper of different colors may be pinned at will, or masses of cotton wool, according to the nature of the "sky effect" that may be required. The stage marked *B* may be a table or upturned box—anything, in fact, that will provide a good steady platform upon which the scene may be arranged. The camera is set up opposite to the stage, as shown; and it should be furnished with a lens of fairly wide angle. In addition to the above apparatus, it will be found desirable to have at one's disposal a couple of screens, which may be fixed up on one side or on both sides of the stage, for the purpose of shutting out the light—a strong top light often being more effective than any other kind of illumination. Any odd pieces of stout card or board of the necessary size will be suitable for these screens.

A great advantage possessed by table-top photography is that it may be undertaken at any time—in dull, wet weather just as much as when the outdoor world is bright and smiling. A fairly long exposure is always necessary; and as one can safeguard one's mimic landscape from the slightest movement, there is virtually no limit to the time during which the lens may be kept open. Certain kinds of table-top photographs may also be taken at night, by means of magnesium wire. A good "fake" of this kind is "The Young Moon," shown in the accompanying picture. Costly apparatus and a vast experience of matters celestial would be required to get a genuine picture of this kind. But by means of a black cloth, a white tennis ball, and an inch or two of magnesium wire, a striking result may be obtained. The deed should be accomplished at night in a quite dark room. Use the black cloth for background, and drape it over a small box, upon which the tennis ball is to be placed. While focusing, get a friend to hold a candle close to the ball. This will enable you to get the rim of the "moon" quite sharp. When all is ready, blow out the light, take the cap off the lens, and burn your strip of wire, holding it in such a position that the strong light falls full upon one side of the ball. The resulting picture will be very puzzling to all who are not in the secret of its manufacture.

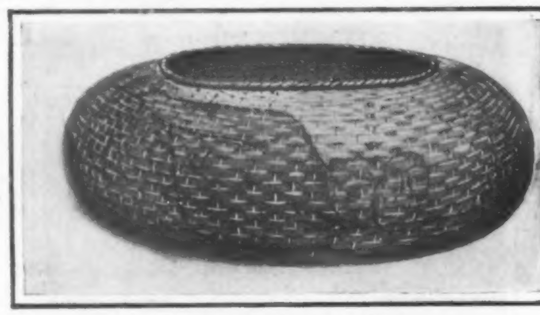
Quite a number of effects may be obtained in a similar manner, this kind of table-top photography being specially applicable as a winter evening pastime. Pile up a quantity of salt or alum to form peaks and ridges, drape a gray cloth to play the part of a "cloudy" background, and then make your exposure as before by means of magnesium wire. A very pretty picture, "Sunrise on the Mountains," will result. This kind of "fake" photography may be carried to almost any extent with surprising success. A few blobs of candle wax, deftly manipulated and arranged upon a sheet of looking glass, supplies a realistic ice floe; while a vessel, cut out in dead black paper, and launched so that she rides above the reflection of a towering berg, adds vastly to the effect. These are a few hints. The imagination of the reader will enable him to produce a score of varied and equally striking results.

To make an imitation lightning photograph, first smoke densely a sheet of glass. This may be done most rapidly over the flame of an oil lamp, care being taken not to hold the glass so close to the flame as to crack it. Then, with the point of a sharp pencil, mark the track of the "lightning" upon the smoked surface, using as a copy, if you like, a genuine photograph of lightning. Now, by means of some boxes, prop up the glass so that a light behind it will shine through the transparent scratches. A candle placed behind the glass enables one to focus, and then the exposure is made by burning a strip of magnesium wire. By setting the glass upon, and at right angles to, another sheet, a good reflection, as though in the waters of the sea or a lake, is obtained.

Perhaps, however, the most fascinating kind of table-top photography is that which is done by daylight. As a typical example of how to set to work, the accompanying photograph of a "Scene in the Alps" may be taken. The mountains are specially selected pieces of coal. The snow is finely powdered alum. The sky or background is a rather dark piece of blue paper, chosen to produce a contrast with the snow-capped mountain top. To increase the effect of height and vastness, the tiny figure, cut out of black paper, was set up upon the "snow" in the foreground. Result, a picture scarcely distinguishable at first glance from some which men have risked their lives to obtain.

Even the eternal snow, the brow of the lofty mountain summit, may be photographed in the study or sitting room. Some cotton batting, pressed to the required shape between the hands, forms the basis. Upon it powdered alum is sprinkled liberally. To supply the necessary effect of vastness a little black figure is added, his footsteps being traced in the snow by means of a pin point. The light streaming from a window near at hand casts a strong shadow under the mountain brow. The cloud effect is rendered by means of some pieces of batting, pinned upon the background, which has been specially moved "out of focus," in order to secure the necessary softness of the mimic mists.

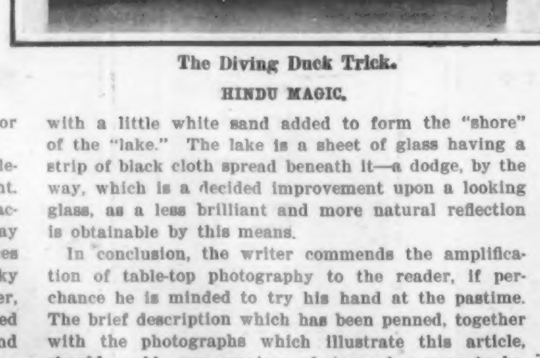
When one once takes up table-top photography as a serious hobby, it is surprising how many little ornamental objects (such as are to be found in every house) may be pressed into temporary service. In the annexed photograph of a Swiss scene, the little châlet is a model that was purchased in Switzerland. It rested upon a shelf for a number of years, and then suddenly found itself among its native snows once more, owing to the craze for table-top photography which had invaded the house! Only the "snow" proved to be powdered alum, while the rock upon which its foundations rested was a lump of coal! Still, the model châlet added much to the effectiveness of the picture.



The Indian Basket Trick.

In "A Winter Scene" also there is a little china statuette which has been promoted in imagination until it plays the part of a full-sized garden statue, half covered with a drift of snow. The leafless tree is just a moss-covered twig. In this way, by permitting one's imagination to rove, and by adapting anything and everything that seems at all likely to prove effective, an almost endless number of pretty and interesting table-top photographs may be established.

The accompanying photograph entitled "A Mountain Lake" is of especial interest because, after being taken, the print was enlarged to cover an area of 7 by 10 inches; and this without loss of effectiveness. Indeed, the resulting picture framed and hung upon a wall would probably deceive everyone to whom it was shown, unless it were subjected to an unusually close scrutiny. Yet the mountain and its lake are "arranged" exactly after the manner described above. The clouds are just cotton, the mountain and its neighboring rocks and hills are so many pieces of coal, while the "snow" is so much sprinkled alum with a little white sand added to form the "shore" of the "lake." The lake is a sheet of glass having a strip of black cloth spread beneath it—a dodge, by the way, which is a decided improvement upon a looking glass, as a less brilliant and more natural reflection is obtainable by this means.



The Diving Duck Trick.

HINDU MAGIC.

In conclusion, the writer commends the amplification of table-top photography to the reader, if perchance he is minded to try his hand at the pastime. The brief description which has been penned, together with the photographs which illustrate this article, should enable any amateur photographer soon to become proficient in the art.

The railways of Peru are run according to American ideas, and the rolling stock is according to American standard patterns, both as regards passenger coaches, freight cars, and locomotives.

HINDU MAGIC.

BY HEREWARD CARRINGTON.

Doubtless we have all heard of the tricks or feats of the Indian Hindu fakir; we have been accustomed to regard his powers as marvelous beyond compare—as performing marvels that no mere Occidental can equal. He can, we are told, make trees grow from the ground or the deck of a boat; he can throw a rope into the air and, causing it to be suspended without visible support, have his assistant climb up that rope, and his head and arms and legs falling to the ground, join themselves together, and finally form the original body and come up whole as at first! He can cause a stone to sink or swim at will, a boy to vanish from a basket, and a hundred other things, too marvelous to conceive. Let us examine some of these powers of the Indian fakir, and see how far they are genuine, and how far they are the result of trickery. We will first consider the famous mango tree trick. This has been the marvel of all oriental travelers from time immemorial, and the correct explanation of this trick has never been made public, to my knowledge.

The performer comes forward and proceeds to make a little mound of earth out of the soil and some water. This can be done anywhere, on the earth, on the deck of a ship, etc. The fakir usually wears next to no clothes, apparently making this trick—if it is a trick—all the more difficult. When the mound of earth is complete, the fakir inserts his seed of the mango tree, and waters it to make it grow. He then covers it with a cloth, and, placing his hands beneath the cloth, proceeds to manipulate the seed for some time. In a few moments he withdraws his hands, and makes passes over the cloth, outside it. A wait; then the conjurer removes the cloth, and the seed is seen to have sprouted. Two tiny shoots appear above the surface of the ground. More passes are made, and when the cloth is removed for the second time a tall mango tree is seen sprouting above the earth. This trick has probably mystified more people than any one that the Hindu fakir performs. It is accomplished in the following manner:

The seed that is placed in the earth is hollow, and within it is placed a branch of the mango tree, previously prepared and folded up. The leaves of the plant are specially adapted for the trick, and they are easily compressed into a small compass. The seed containing the mango shoot is placed beneath the earth, and when the conjurer places his hands underneath the cloth he works out a part of this folded-up branch, and leaves it sticking out above the surface of the mold. This is repeated several times, until all the branch is showing above the mold, when quite a respectable sized tree is seen to be sprouting. If the seed is examined before the trick is exhibited, the conjurer has previously exchanged the one examined for the trick seed at some convenient moment before placing it in the ground.

Sometimes, the seed is seen to grow into gigantic proportions—into a regular tree, bearing fruit, in fact! It is probable that much of this is exaggeration pure and simple; but there is a manner of working the trick, or rather extending it, so that a very large tree can be produced at the conclusion. It is this: The conjurer has the large tree concealed beneath a thick cloth—a duplicate of the cloth he uses to cover the seed at first. After uncovering the seed several times, and showing it grown more and more, he uncovers it for the last time, and, while the audience is gazing at the plant wonderingly, the conjurer takes occasion to exchange the cloth for the one containing the big tree underneath it. Now, he quickly covers over the plant with this cloth, and when it is removed, there is the tree, full grown. It may be several feet in height. It was compressed beneath the covering cloth. People do not think of asking to look under the cloth the last time, because they have often seen beneath it, and know it contains nothing. They therefore assume that it contained nothing the last time the mold was covered over.

Now we come to the famous basket trick, which has also mystified thousands, and yet is simplicity itself. A large oval basket is shown, something the same shape as an egg, laid on its side, and an opening cut in the upper surface or top. It is first shown empty. Then a small boy is shown, wearing a jacket and turban. He is placed in the basket, and the opening is covered over with a blanket. The basket is so small that the boy apparently fills the whole of the basket. What is the surprise of the spectators, then, to see the fakir suddenly leap into the opening of the basket, and proceed to stamp about as vigorously as he can—treading on the ground, and apparently showing that the boy has disappeared, and is no longer in the basket! To make assurance double sure, however, he snatches up a sword, and proceeds to run the basket through and through in all directions. No sound issues from the basket.

There is an ominous silence. Evidently the boy has disappeared. But the conjurer turns around and shouts, and the boy, wearing the same jacket and turban, is seen in a neighboring tree. He descends. A tom-tom is beaten, and after a few incantations, the basket is seen to stir, and soon the blanket heaves up, and is thrown aside, and the boy is seen standing before us, as sound as ever. This trick, like the last, can be performed in any locality, on the deck of a ship, etc., thus showing that trap-doors have nothing to do with the result. How is it done?

First, as to the basket. It will be seen, when we think it over, that the peculiar shape of the basket renders it capable of being employed in the following manner: The small boy, as soon as he is placed in the basket, curls up, and wriggles his body, eelwise, around the edges of the basket. That is, he coils around the inner surface, just as a snake might coil up within it. Now it will be seen that it is possible for the conjurer to leap into the opening, stamp on the ground, etc., since the open space in which he treads is unoccupied by the boy's body. He steps in the middle of the circle of flesh. And when he runs the sword through the basket, he only runs it through those places where the boy's body is not concealed.

So much of the trick is plain: how about the disappearance and reappearance in the tree? There are *two* boys, dressed exactly alike. The first one never leaves the basket. He simply remains quiet until he receives the signal to show signs of life again. The second boy climbs up a neighboring tree at some convenient moment, and shouts when he sees it is the proper time to make his presence known. So much for the famous basket trick!

A very clever trick often seen is the following: It is known as the "dry sand trick." The fakir brings forward a pail which he proceeds to fill with water. He then shows some ordinary sand, quite dry. To prove its dryness, he takes up a handful, and blowing sharply upon it, scatters it in all directions. He then takes up another handful and drops it into the water. We can all see it lying in the bottom of the pail, under the water. Next, showing his hands empty, he places one in the pail, and brings out a handful of the sand. Blowing upon it, it still scatters in all directions—showing it to be as dry as ever. This is repeated several times, until all the sand is again extracted.

This is a very clever trick, and would never be discovered, unless its secret were told. It is performed in the following manner: Fine, clean sand is selected, washed carefully in hot water several times, and dried in the sun. Some of this sand is then placed in a frying pan with a lump of fresh lard and is cooked until all the lard is burned away. The result is that every particle of sand is covered with a thin coating of grease, so that when this sand is dropped into the water the sand is impervious to the water (owing to its coat), and so remains as dry as ever.

Another trick that Indian fakirs perform is known as the "colored sands trick." The conjurer eats several colored sands or sugars—blue, red, yellow, etc.—and swallows them. Nevertheless he can, at the request of any of the spectators, immediately blow out of his mouth any one of the colored sugars desired or called for. This is repeated until all the colors are blown out in turn.

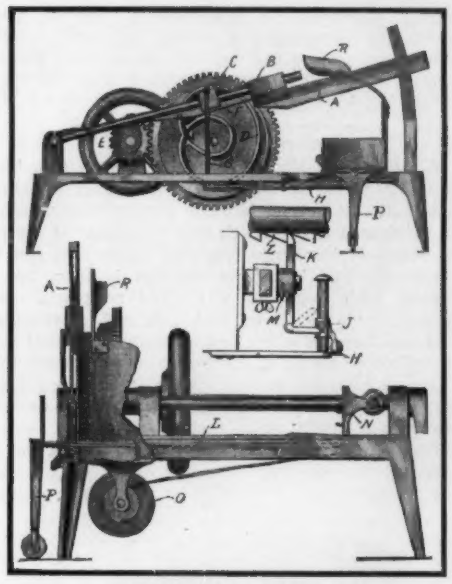
The conjurer really swallows the sugars, in the first case—to his detriment, be it said. But he has, concealed in his mouth, several little capsules, each containing one of the sugars of the same color as that eaten. These are concealed within the mouth, between the teeth and the cheek, in various positions around the mouth—in a certain order, which the conjurer knows. Now, when any color is called for, the conjurer simply works the capsule containing this color to the front of his mouth, breaks it with his teeth, and immediately blows out the sand. This is repeated until all the capsules are broken in turn.

A little trick sometimes shown is known as the "diving duck." A bowl is shown empty, and then filled with water. In the water is now placed a small artificial duck. Upon command of the fakir, it dives quite naturally of its own accord; then it rises to the surface, and this is repeated several times. At the conclusion of the performance, the duck is taken out and handed to the spectators, who can examine it. No amount of examination will reveal the secret, however. It is this: A fine silk thread passes up through a small hole in the bottom of the bowl, and when the conjurer places the duck in the water, he manages to slip this thread around the duck. Now, he has only to pull this thread, when bowl is filled, and the duck dives. At the end of the performance, the thread is broken, and the duck may be examined as much as desired.

Patent Department

MACHINE FOR SLICING BREAD.

Although the machine which is here illustrated has been specially designed for slicing bread, it may be used with equally good results for slicing vegetables



A BREAD-SLICING MACHINE.

or any other articles capable of being cut with a knife. The special advantages of this machine are that it is light-running, compact, and of simple construction, and that a draw-cutting action is continuously imparted to the knife while the machine is in operation. The action of the knife and the feed of the material to the knife is automatic, and capable of adjustment for cutting thick, medium, or thin slices.

In the accompanying engraving the knife is indicated at *A*. It is attached to a block *B*, mounted to slide on a bar which normally holds the knife in its upper position under tension of a spring. This bar is connected to a cam roller *C*, which engages a cam rib *D* formed on the face of a gear wheel. Meshing with this gear wheel is a pinion *E*, to which is affixed a crank. A rod *F* connects this crank with the carrier *B*. When the gears are turned, the crank causes the knife *A* to be drawn back and forth, while at the same time the cam *D* alternately depresses and releases the knife. The bread to be sliced is supported on a carriage, which is automatically fed under the knife after each stroke. The feed mechanism is operated by means of a connecting rod *G*, attached to the lever *H*, which rises and falls with the bar on which the carrier *B* is mounted. When the rod *G* is raised, the bar *J* is lowered, and coming in contact with a pawl on the latch *K*, serves to swing the latter out of engagement with the ratchet teeth *L* formed on a bar under the bread carriage. The latter is then drawn forward by a coil spring *O*, operating a drum on which is wound a cord that connects with the rear end of the bread carriage. As soon as the latch *K* disengages the rack, the bar *J* slipping past the pawl releases the latch, and permits it to return under action of the spring *M* and engage the next tooth *L*. There are three sets of bars formed with ratchet teeth and the teeth are of different lengths on the several bars so that by adjusting the latch to engage one or another set of teeth the slices will be cut correspondingly thick or thin. The bread is held in the carriage by means of prongs formed on the rear wall, as indicated at *N*. The forward end of the carrriage is supported on a roller *P*. While the bread is being sliced, the operator may hold it down on the carriage by pressing down on the spring plate *R*. The inventor of this slicing machine is Mr. Edward A. Seaburg, of Seattle, Wash.

SOME RECENT TOYS AND TRICKS.

He learns best who is taught unawares, and hence when a toy illustrates a scientific principle, or serves as a means of instruction, its value is more than doubled. Most of the toys in the following collection are of the educational class. The boy who owns a geographical globe, such as illustrated in Fig. 1, will doubtless develop a great interest in geography and navigation. The globe is partly filled with water or oil, which supports a float. The latter carries a magnet with the poles touching the inner surface of the globe. On the face of the globe a small ship with an iron keel is placed. As the globe is turned about, the magnet is moved to different positions, and the ship, owing to magnetic attraction, is made to sail to different ports. The principal lines of navigation are marked on the globe, and the game is to move the globe so that the ship will sail along these lines.

The device shown in Fig. 2 is called a "sound motor." It is adapted to be placed on the sounding board of a piano or other musical instrument, and when the instrument is played, the dial of the motor slowly rotates. The secret is shown in the cross-sectional view. The dial is pivoted on a central pin, and its periphery is supported by a series of bristles. The sound serves to vibrate the dial, and the intermittent flexing of the bristles causes the dial to turn on its axis.

In Fig. 3 we have a trick pipe, based on a well-known scientific principle. The exhibitor produces a pipe, places a paper disk over the bowl, and putting the stem in his mouth, blows the disk off with a sudden puff. Then he hands the pipe to a friend, asking him to do likewise. Strange to say, the latter is unable to blow off the disk, and even when the pipe is turned over while he is blowing, the disk hugs the mouth of the bowl. The reason is that the air which is blown through the pipe, on reaching the disk spreads out in all directions in a thin sheet, and produces a partial vacuum under the disk, so that the latter is held to the pipe by the pressure on its outer surface. The opening in the bowl is of much smaller diameter than usual, and a central pin on the disk serves to hold the latter in proper position on the pipe. The pipe is provided with a secret passage in the wall of the bowl, and there is a hole in the stem, which may be turned to register with this passage. The exhibitor turns the stem so that when he blows, the air passes partly through the bowl and partly through this passage. Hence the disk is tipped up on one side, so that the partial vacuum is not formed, and the paper may readily be blown off. As a precaution, the secret passage is provided with a valve connected to a flexible sleeve placed on the outside of the bowl. The exhibitor, by flexing this sleeve, opens the valve. The advantage of this is that in case he should forget to turn the stem when handing the pipe to his friend, the valve will still prevent the latter from performing the trick.

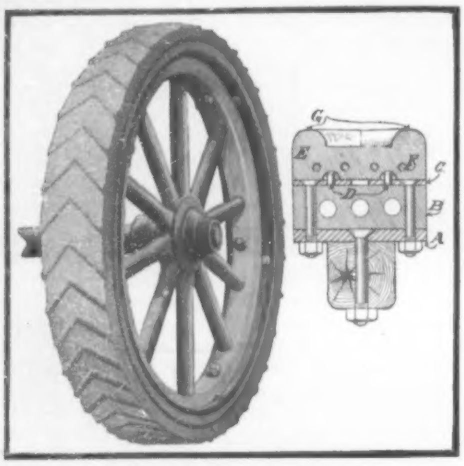
Few people realize that a steel ball will freely roll around the end of a magnet pole, from which it may be pulled off only with the greatest difficulty. The property is utilized in Fig. 4. It consists of a blowpipe fitted with a magnetic needle at one end. A light top provided with a steel stem is suspended from the needle by magnetic attraction. On blowing through the pipe, the top is spun by the stream of air issuing from the pipe, but the rotation of the top does not cause the spindle to fall off the needle.

The trick cigar illustrated in Fig. 5 can hardly be classed as an educational toy. However, it is such a vast improvement upon the ordinary trick cigars, which explode when they are partly consumed, that we have included it in this list. Its operation hardly needs any explanation. A stiff wire spring with the ends tied together under tension is placed in the cigar. As the cigar is smoked the string is burned, and the spring flies open, much to the astonishment of the smoker, and yet without endangering his eyesight.

SOME RECENT TOYS AND TRICKS.

TIRE FOR AUTOMOBILE WHEELS.

The accompanying engraving illustrates a novel double-cushioned tire construction, adapted to take the place of pneumatic tires now commonly employed. One of the special advantages of this construction is that it prevents the wheel from skidding. In addition to this, the tire is strong and elastic and not liable to

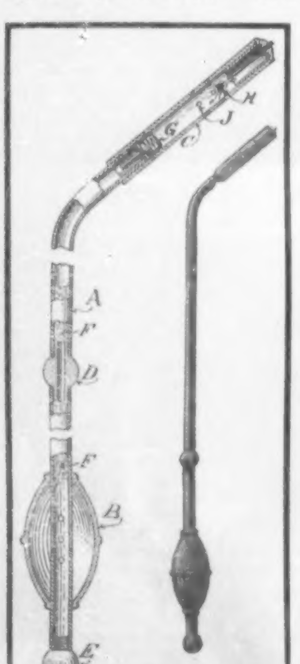


TIRE FOR AUTOMOBILE WHEELS.

injury. The cross-sectional view illustrates the details of the invention. At *A* is a steel band about ¼ inch thick and 3 inches wide, which is bolted to the wooden felly of the wheel. Mounted on this band is a rubber cushion *B*, an inch thick, which runs around the wheel. Over this cushion is a pair of bands *C*, which are separated from each other by a space of about ⅜ of an inch. The rubber cushion is clamped between the upper and lower bands by means of bolts, as indicated in the drawing. These bolts are free to slide through the lower band when the cushion is compressed. To increase the cushioning effect, the rubber is formed with holes which extend throughout its length. The upper bands are provided with half-round shoes riveted thereto, as indicated at *D*. Fitted over these bands is the outer cushion *E*, of rubber, which is firmly held in place by means of wires *F*. The outer cushion of rubber is provided with a series of ridges *G*, which are preferably of V shape. These serve the purpose of cleats to afford a greater tractive effect. The advantage of forming these ridges of a V shape, instead of running them diagonally across the face of the tire, is that the two branches of the V counteract each other, and prevent any tendency toward a lateral movement. With tires of this type chains are unnecessary, as the V's prevent skidding of the wheel. The inventor informs us that owing to the fact that air can circulate between the ridges, the wheel does not produce as much dust as the ordinary automobile wheel. For this reason he believes that the tire would be of value for use in parks or parkways, where there is considerable agitation against the dust raised by rapidly-moving vehicles. The inventor of this automobile wheel is Mr. Irving Snell, Little Falls, N. Y.

AN AUTOMATIC GAS LIGHTER.

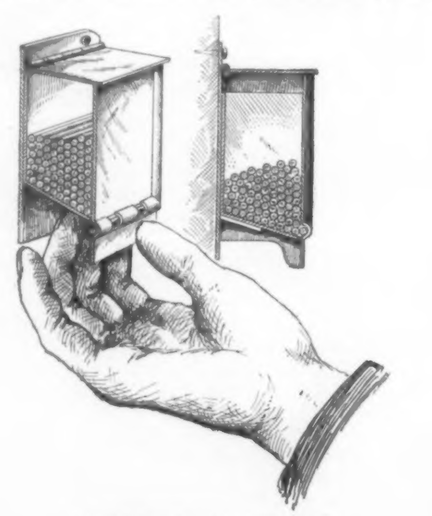
Pictured in the accompanying engraving is a gas lighter of portable type, in which a flame is created at will by directing alcoholic vapors to a catalytic igniter. This is done in such a manner as to effectually prevent the possibility of an explosion or ignition of the vapor in the reservoir of the lighter. One of the figures shows a sectional view of the device. It consists of a tube *A*, provided at its lower end with an air bulb *B*, while at the upper end is a cap *C*, in which the catalytic igniter is suspended. The tube *A* consists of two members, which are connected by a coupling *B*. The lower end of the tube is closed by a plug *E*. At each side of the coupling *D* the tube is stored with absorbent material, saturated with alcohol. The bulb *B* when compressed forces air into the tube and through the absorbent material, and the air becomes saturated with alcoholic vapor. The upper end of the tube *A* is closed by a valve *G*, which opens against the tension of a spring when the alcoholic vapor is forced upward by operating the bulb. The vapor, passing through the valve *D*, comes into contact with a bunch of fine platinum wire, which possesses the property of becoming highly heated when exposed to gas. Thus, the gas is ignited and issues from the openings *J* in the form of a flame. The valve *G* closes as soon as the air and gas are forced past it, so that when the bulb *B* expands, it is impossible to draw the flame down into the reservoir of alcohol, and thus an explosion or ignition in the reservoir is avoided. The inventor of this lighter is Lewis B. Prahar, 124 Pearl Street, Brooklyn, N. Y.



AN AUTOMATIC GAS LIGHTER.

ODDITIES IN INVENTION.

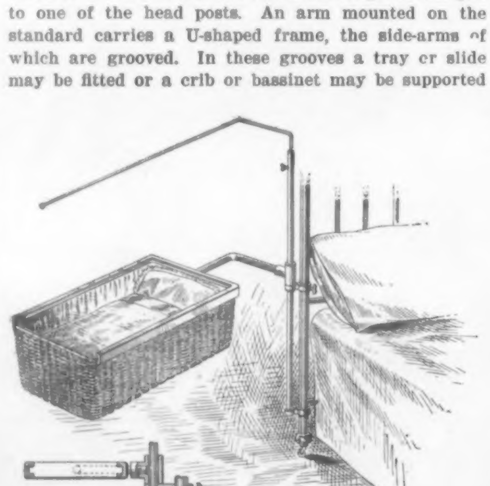
A Convenient Match Safe.—The match safe illustrated herewith is designed to deliver or discharge one match at a time into the hand of the operator. It consists of a box which may be opened at the top to permit of introducing matches into an interior receptacle. The bottom of the box is open, but is formed with cleats on which the receptacle rests. The latter is closed on each side and at the rear, and also has a slanting bottom wall. The front wall of the outer casing of the box proper is formed with a groove or recess of such size as to contain but one match. In operation the receptacle is moved upward, leaving one match, which rests in the recess, and the latter, as soon as it clears the bottom wall of the receptacle, falls into the operator's hand. On releasing the receptacle the latter falls to its normal position,



A CONVENIENT MATCH SAFE.

and permits another match to enter the recess, whence it is discharged when the receptacle is next operated.

Bracket Attachment for Beds.—A resident of Allegheny, Pa., has invented an attachment for supporting a crib or tray in close proximity to a bed. A vertical standard which is preferably hollow, is rotatably secured to the bed in a sleeve and a socket piece clamped to one of the head posts. An arm mounted on the standard carries a U-shaped frame, the side-arms of which are grooved. In these grooves a tray or slide may be fitted or a crib or bassinet may be supported



BRACKET ATTACHMENT FOR BEDS.

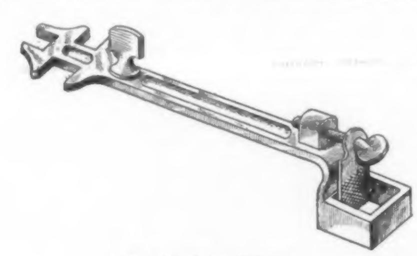
in the manner illustrated. Fitted into the hollow standard is a rod which may be secured thereto by a set-screw and which projects over the crib. This may serve to support a curtain. The advantage of this arrangement is that the crib may be drawn close to the bed whenever the baby requires attention without requiring the occupant of the bed to arise.

Rubber-Tired Rocking Chair.—A Western inventor has devised a pneumatic shoe or tread, which may be applied to the rockers of a chair, so as to render the motion of the chair easy and noiseless, and prevent creeping and damage to the floor and walls of the apartment, or to the furniture with which the rocker may come in contact. The shoes may be applied to the rockers irrespective of their width or form, and each shoe is formed with a bumper at the rear end, which during excessive backward movement of the chair will engage the floor, and thus prevent over-

A RUBBER-TIRED ROCKING CHAIR.

turning. Would that all apartment houses were supplied with quiet rockers!

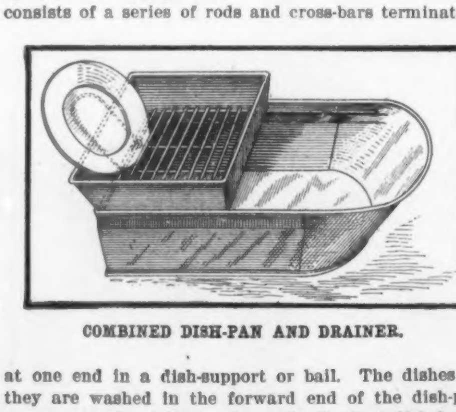
A Handy Wrench.—The wrench illustrated herewith is particularly adapted for removing nuts from axles, and is fitted with means for holding the nut to the wrench, so that it will not fall to the ground when unscrewed. The socket, which is adapted to receive the nut, is formed with a plate of resilient metal, which may be pressed against the nut to clamp it in the socket. The upper end of the plate is connected to a thumb screw that is screwed into a lug on the handle of the wrench. By turning this screw the plate is moved to the clamping position.



A HANDY WRENCH.

To facilitate operating the wrench, the opposite end thereof is provided with a knob, swiveled to the handle of the wrench, and after the nut has been clamped in the socket, the wrench may be turned by grasping the knob in the fingers and revolving the wrench so as to unscrew the nut. The entire operation of removing the nut or applying it to the axle may thus be done without soiling the fingers, as it is unnecessary to touch the nut.

Combined Dish-pan and Drainer.—A useful household article has recently been invented which will facilitate the washing and draining of dishes. It consists of a dish-pan of greater length than its width and preferably formed with a rounded inclined wall at one end. Set into this pan, at the opposite end, is a dish-drainer formed with sheet metal walls and having a skeleton bottom. The drainer is arranged to fit snugly into the dish-pan so that it will be held therein by frictional engagement. The bottom of the drainer consists of a series of rods and cross-bars terminating



COMBINED DISH-PAN AND DRAINER.

at one end in a dish-support or bail. The dishes as they are washed in the forward end of the dish-pan are supported on edge on the rods, the first dish being leaned against the bail. Being supported in upright position the dishes will drain readily and while in the drainer boiling water may be poured upon them to rinse them. Since the drainer and dish-pan are combined in a single article the dish washer will be saved many unnecessary steps.

RECENTLY PATENTED INVENTIONS.

The patents described in this department have been secured through the Scientific American Patent Agency, 361 Broadway, New York, N. Y.

Electrical Devices.

ELECTRICAL HOIST.—G. RASMUS, New York, N. Y. The object is this case is to provide an electric hoist having an electric motor provided with a revoluble armature and a revoluble field, the latter being driven from the armature and forming the hoisting drum, so that the apparatus takes up very little room, requires no brake mechanism and is exceedingly serviceable for use in overhead traveling cranes.

TELEPHONE-RECEIVER SUPPORT.—M. M. KAHN, Louisville, Ky. This invention illustrates a very simple and serviceable device for use in supporting a telephone receiver in proper position near the transmitter so as to leave the hand of the user free. The device comprises an ingenious series of connected members, the inner end being attachable to the arm of an ordinary telephone transmitter and at the outer end a standard is provided the top of which forms a seat for the receiver and the foot of which is adapted to rest on a desk or other convenient support.

ELECTRIC RAILROAD-SIGNAL.—T. C. FOGARTY, F. W. BROCK, and F. A. BOWDLE, Chatham, Ill. The improvement is in the nature of a novel construction and arrangement of block signal systems and relates especially to that form of signal systems adapted for electric railroads in which a continuous feed wire carrying an operating circuit of 650 volts is employed. The invention consists in the construction and arrangement of the switch and switch operating devices controlled by the passage of the car.

Of Interest to Farmers.

SEED-CLEANER.—J. H. HEMPEN, Alexandria, La. This invention is particularly useful in connection with apparatus for cleaning and freeing from foreign substances, cotton-seed, rice, wheat, corn, and other grain. The cleanser frees the seed from chaff and trash, as well as from particles of foreign matter or other impurities of higher specific gravity than the seed. It is automatic in action, and adjustable for use in cleansing seeds or granular material, and in which impurities capable of magnetic attraction are removed from the material by means of an electric magnet.

DRAFT DEVICE FOR PLOWS.—A. J. MINOR, Canton, S. D. The invention relates to draft devices, and especially to such devices when used for drawing plows. More specifically, to draft mechanism of this kind which is constructed so as to enable the animals to be hitched to the plow out of alinement with the plowshare, a construction being provided which tends to prevent side draft. Thus, the plow will continue in a straight line although the pulling force is applied at a laterally displaced point. The construction facilitates adjustment of the device to suit the pulling force.

Of General Interest.

BOTTLE-NECK AND CLOSURE THEREFOR.—A. MCCAMBRIDGE, Williamstown, N. J. The purpose in this case is to provide details of construction for a bottle neck and closure which are very simple, and that when assembled after the bottle has been filled, will permit the free out-pouring of the liquid contents of the bottle but prevent refilling of the bottle.

CARD-HOLDER.—P. M. MATHESON, San Juan, Porto Rico. The holder is used in affixing price marks to clothing and articles in show windows, etc. The device is constructed of a single piece of wire by bending it to a point intermediate its length to provide a head, with the free ends of the wire brought together and arranged side by side, one of which is formed with a pointed extremity to provide a pin, and the other bent upon itself in a plane at right-angles to the plane of the head to produce a hook for engaging and holding the card.

SHAVING-MUG.—T. D. MCKOWN, Pittsburg, Ga. One of the objects of the invention is to provide a simple and inexpensive mug, in which a soap holder is provided with a water-jacket serving to keep the soap suds from drying out when the mug is being used, and so constructed that the entire device can be easily and thoroughly cleaned.

RECEPTACLE-HOLDER.—C. C. LITTLE, San Jose, Cal. The holder is for use in holding cups, glasses and other like receptacles more especially constructed for the use of water color painters in outdoor sketching, and is adapted to be applied to the cross bar of an easel or other support in a manner to carry the glass in an upright position. There is a seat provided for the glass, and means for embracing the body thereof when placed on the seat, and for attaching the holder to a support.

Hardware.

WINDOW-LOCK.—L. G. MILLER, New York, N. Y. The invention relates more particularly to that type of lock which includes a locking member secured to one sash, and a keeper or casing on the other sash, adapted to engage with one end of the locking member to retain the two sashes in engagement with each other and prevent the window from being opened.

Heating and Lighting.

GAS-MANTLE SUPPORT.—C. J. BARTON, Big Rapids, Mich. The so-called gas mantles attached to gas burners for intensifying the brilliancy of the flame, are very brittle and liable to be cracked or broken off when jarred or otherwise set suddenly in vibration. To avoid this result, and thus prolong the "life" of such mantles, the inventor has devised an improved means for supporting them from a burner.

Household Utilities.

WRINGER.—D. A. SAWYERS, Unionville, Iowa. The invention is particularly useful in connection with devices used for wringing out mops, wash-rags, and the like. An object is to provide a wringer arranged to be moved from place to place, having a frame adapted to support a receptacle such as a pail, and provided with means for wringing out mops, wash-rags, and the like.

TABLE.—A. B. PHELAN, Alliance, Neb. This invention relates more particularly to improvements in that type of table in which there is provided a compartment beneath the top thereof which may be uncovered by moving said top. The compartment may be employed for the storage of kitchen or table articles, or may, if desired, be employed as a sink.

WASTE-PIPE CLEANER.—W. T. LISENBY, Longbeach, Cal. The invention is an improvement in waste pipe cleaners, having among other objects, the provision of an effective means for instantly unchoking and cleansing waste pipes which become clogged with paper, grease, or other foreign substance. Means are provided whereby as the piston is reciprocated any material which might become lodged in the pipes is positively forced out.

COMBINED CLOTHES AND CLOTHES-PIN RECEPTACLE.—W. H. CARPENTER, Lehr, N. D. The receptacle is adapted to be carried upon the person for use in hanging clothes upon or removing them from a line. The inventor's aim is to provide an inexpensive and simple receptacle of separate compartments, adapted to be hung by means of suitable straps from the shoulders of the user.

Machines and Mechanical Devices.

SELF-LUBRICATING SHAFT.—E. L. WOOD, Long Island City, N. Y. There is difficulty in lubricating shafting revolving at high velocities, because centrifugal force repels the oil. Mr. Wood puts the oil inside. This has been before proposed but he has made improvements which are radical and important. He provides convenient and reliable means of insuring a slow discharge under all conditions, with an increased rate of discharge when the shaft is revolved.

HYDRAULIC PRESS.—T. E. HOLMES, 8 Oakdale Road, Nether Edge, Sheffield, England. This invention pertains to hydraulic forging presses and the like worked by means of steam hydraulic intensifier apparatus, and wherein the valves for controlling the admission and exhaust of steam to and from the intensifier and lifting cylinders and for controlling the connections between the air vessel and the high pressure hydraulic system are all controlled by a single handing lever.

FRICTION-CLUTCH.—H. N. DAVIS, Independence, Mo. The object of the invention is to provide a clutch very effective and practically noiseless, and arranged to automatically connect the driving member with the member to be driven, as long as the driving member rotates in a forward direction, and to immediately and automatically release the driven member as soon as the forward motion of the driving member ceases or the driving member runs in a reverse direction.

AIR-LOCK FOR MINES AND TUNNELS.—P. H. DURACK, El Paso, Tex. In carrying out the invention two air locks are provided, one being located near the mouth of the mine shaft or tunnel, and another being placed contiguous to the heading or foot of the shaft or tunnel; and two pipes are arranged in the shaft or tunnel, one for conducting fresh air into the same and the other for removing foul air and water therefrom.

SOUND-REPRODUCING MACHINE.—J. SCHWAN, New York, N. Y. The machine is constructed as a permanent part of a support having a flat top and in the nature of a table, and the machine casing is movably supported below the top. The support is provided with a number of horns radiating to its border and connecting with the horn of the machine, which serve to uniformly distribute the sound waves throughout the room. Thus the ordinary use of the support as a table is not impaired, and the machine, which is to many an unsightly object, is concealed and protected from dust.

SELF-CONTROLLING DEVICE FOR NOTE-SHEETS.—H. MEYER, New York, N. Y. The object of the invention is to provide a device, more especially designed for causing the note sheet to travel at a uniform speed by rotating the winding up roller at a speed decreasing in proportion as the sheet winds up on the winding up roller, thus compensating for the increase in peripheral speed by the increasing thickness of the note sheet roll on the winding up roller.

PNEUMATIC ACTION.—H. MEYER, New York, N. Y. The invention relates to self-players, self-playing pianos, and like musical instruments, and its object is to provide a pneumatic action which is very compact, not liable to get out of order, and arranged to allow convenient and minute adjustment of the valve from the outside, to render the action exceedingly sensitive.

DOOR OPENER AND CLOSER.—P. D. GALARNEAU and W. S. NEWTON, East St. Louis, Ill. The construction of this device embodies a line having two branches, one of which is attached directly to the door and the other passing to the door lock and connected therewith in such a manner that when the line is pulled the door if locked and closed will be unlocked and then opened, or if the door be opened, a pull on the line will close it.

Prime Movers and Their Accessories.

VALVE MECHANISM FOR ENGINES.—W. L. WAYRYNEN, Dolph, S. D. One of the objects in this invention is the provision of means whereby the exhaust valve is automatically opened at the end of the exhaust stroke and held open by the escaping gas while the piston is completing its exhaust stroke.

GAS-ENGINE IGNITER.—W. C. PLANZ, Las Flores, Lower California, Mexico. This invention relates to improvements in ignition devices for use in internal combustion engines, and more particularly to that type of ignition device in which a small portion of the explosive charge is compressed in the ignition cylinder to such a pressure that it spontaneously ignites and serves for igniting the main charge in the main engine cylinder.

ELASTIC-FLUID BURNER.—W. F. LEES, H. A. LEES, and C. W. GRISE, San Diego, Cal. The invention refers to elastic fluid turbines, the more particular object being to produce a turbine operated by the expansive force of gases, such as are produced by the explosion of heavy or light crude oil, petroleum refuse, anthracite, and bituminous gases, water and coal gases, benzine, gasolene, ethylene, marsh gas, natural gas, acetylene gas, semi-water gas, producer gas, various hydrocarbon gases, and alcohol.

Railways and Their Accessories.

ADJUSTABLE EXHAUST FOR LOCOMOTIVES.—H. H. MACKEY, Durand, Mich. In the present patent the object of the invention is the provision of a new and improved adjustable exhaust for locomotives, arranged to control the draft of the boiler, according to the work done at the time by the engine, so as to save fuel.

CAR-REPLACER.—W. M. KITCHEN, Havana, Fla. In operation the derailed car is moved forward until the flanges of the wheels engage the inclined faces of the integral flanges. Continued movement of the car forces the wheels toward the rails, and as the flanges engage the friction rollers, they trip the wheels, dropping them onto the rails with flanges in proper position. The plates are laid flat upon the ties, and engagement of the groove of one of two plates with the rail retains the other in place, and the latter is retained in place by weight of derailed car, the flange of the first mentioned plate receiving the greater stress.

Pertaining to Recreation.

TOY.—A. E. WOOLHOUGH, New York, N. Y. The invention relates to dolls, bears, and similar figure toys, having movable members such as legs or arms, and its object is to provide a toy arranged to allow of turning any one of the movable members independent of the others, and to hold the movable members firmly in any adjusted position, and to produce sounds within the body of the toy on turning any one of the movable members.

FISHING-FLOAT.—W. VON ROSENBERG, JR., Austin, Tex. The inventor has for his object the construction of a float, the attachment and detachment of which may be effected with great facility; and further to improve the float, or rather its attaching means, to the end that when the line is subjected to undue strain, as when the hook or sinker is snagged, that the line will not be subjected to a breaking strain at the float, in response to its tendency to assume a straight direction under the tension exerted on the line.

PUZZLE.—G. CHAPMAN, Arlington, N. J. The object in this instance is the provision of a puzzle embodying a movable body and a certain defined course or path over which the body is to be moved, the body and path being screened from the direct view of the operator who observes them only through the reflection of a mirror, whereby the natural order of things is reversed.

Pertaining to Vehicles.

ROLLER.—J. M. BEALY, Villapark, N. J. The invention is particularly useful in connection with road and lawn rollers as well as rollers for other purposes. One object is to provide an inexpensive roller having a smooth and hard rolling surface, and so constructed that the height of the roller is suitably proportioned to the weight thereof, to render the device most efficient.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Full hints to correspondents were printed at the head of this column in the issue of August 8th, or will be sent by mail on request.

(10863) P. M. says: I am a high-school boy, and a friend of mine and I want to construct a wireless telegraph. Our homes are about one mile apart and we want to know if it would be possible to construct one at a reasonable cost. 1. Would thunder-storms cause any trouble; i. e., if lightning struck the pole what would happen? 2. About how high would the poles have to be? 3. Have there been any articles in the SUPPLEMENT telling how to construct a simple wireless telegraph? 4. Could you refer us to a few good books on the subject obtainable at a public library? A. We can furnish you SUPPLEMENT No. 1363, price ten cents, which contains a full description of a set of wireless telegraph apparatus for sending one mile. A larger set is described in SUPPLEMENT No. 1605, with full instructions for setting up and tuning a station, in SUPPLEMENT Nos. 1622, 1624, 1625, at ten cents each. These will give you the principal points which you will require to know. Of course a thunder-storm, or lightning, will do to the aerial for the wireless telegraph just what it will do to any other tall object which it strikes. The apparatus must be provided with a reliable lightning arrester. The aerial is always provided with a good ground. It is indispensable. Perhaps an aerial 18 feet above the house top will answer for a mile transmission. We would name good books for your study, Collins's "Wireless Telegraphy," price $3.00; Maver's "Wireless Telegraphy," price $3.00; Collins's "Manual for Operators," price $1.50. We shall be glad to furnish any or all of these books upon order.

(10864) H. H. F. says: Having studied the question from all sides, I should like to know what reason there is for not using a vertical open front engine on sidewheel steamers. According to several engineers on sidewheel vessels, this type of engine could be used to good advantage by simply placing the machine across the beam of the ship instead of fore and aft, swinging the shaft a little lower and placing the cylinders well up in the housing. It is a well-known fact that inclined engines wear on the underside of all the parts of cylinders, slides, piston, making it hard to keep them in good shape. In using a vertical engine, all this would be done away with, and these advantages gained: Economy of space, compactness, even running and wearing of parts, accessibility of parts, dynamos could be placed in engine room, less vibration. A. We are doubtful if the use of vertical engines with cylinders above the shaft would effect either of the first two or the last of the advantages you claim for it in sidewheel steamers (economy of space, compactness, or reduced vibration). There might be some economy of hold space by having the cylinders vertical instead of inclined, but this would be at the expense of deck or cabin space. The larger the diameter of the paddle wheel the greater its leverage, and consequently the greater the height of the shaft above water-line, and lowering of the shaft would reduce this leverage. The principal objection to superimposed vertical cylinders, however, would be the raising of the center of gravity of the boat higher above the center of buoyancy, tending to topheaviness, and the use of horizontal or inclined engines is with a view to keeping the center of gravity of the boat as low as possible to give increased stability. For this reason if vertical cylinders were used it would be better to have them below than above the shaft. Another objection to vertical cylinders in a sidewheel steamer is the increased tendency to roll in a beam sea due to the alternate vertical thrust of the pistons on opposite ends of the shaft, whereas the alternate thrust in a fore-and-aft direction has no such tendency and only causes an uncomfortable vibration in over-engined boats.

(10865) E. B. M. says: I, as well as several friends, am obliged by our business to go into out-of-the-way regions where the need may possibly arise to use a revolver against a "heathen." Perhaps your valuable columns may settle a discussion which has arisen. 1. Which has the greater penetration and muzzle velocity—one of the modern smokeless-powder automatic revolvers such as the Mauser or the Colt 32- or 38-caliber automatic, or a heavy "frontier" 44- or 45-caliber revolver using black powder? A. The small-bore automatic pistols using high-explosive smokeless powder are beautiful pieces of mechanism and have undoubtedly both higher penetration and muzzle velocity than the older and larger-bore weapons using black powder, but for self-preservation in emergency commend us by all means to the latter, for the following reasons: If you wish to see how far into a boiler plate or how far up the grain of a log of wood you can shoot, the small-bore, high-explosive weapon is preferable; if, again, you are sitting in a fort or other cover and you have no weapon but a pistol with which to pick off as large a number as

possible of men advancing to attack you across half a mile of open country, use the Colt or Mauser repeating pistol by all means; you can use it from the shoulder with a detachable stock and do vastly more accurate long-range shooting than you can begin to do with any other pistol. But for more ordinary self-defense at close range, we should certainly prefer the older, larger-bore, slower-shooting pistol. 2. From the experience of army officers and frontiersmen, which of the types of revolvers above mentioned is thought to have the greatest "stopping power"; i. e., supposing that a vital part was not struck, which arm would have the greatest disabling effect? A. As to "stopping power," it is not a question of "supposing a vital part were not struck"; a vital part may be pierced by a small-bore, high-penetration bullet without its stopping the aggressor sufficiently quickly. The writer has repeatedly had the experience of being unable to find, in dense jungle, game which he felt sure had been mortally wounded, and the more convincing evidence of finding, after great difficulty, animals which proved to have been shot through the heart or the brain, but which had had strength enough to hide themselves 100 feet or so away from where they were hit in dense jungle before they dropped dead. These were shot with a .303 Sporting Lee Metford high-penetration, flat-trajectory, range anything up to three miles, a beautiful little gun with which the writer has done better target shooting than with any other, but which he gave up for big-game shooting in favor of a .500 express and an old converted military Snider .550 entirely on account of the higher stopping power of the latter much older models which possessed none of the above-mentioned advantages of the former, and never after lost game which he was at all confident of having hit. He has also narrowly escaped the charge of a rhinoceros which proved afterward to have been mortally wounded by the small-bore gun, and once received a nasty crack on the head from the kris of an "Amok" Malay (fortunately turned flatwise by a blow on the latter's upraised arm) after the "heathen" had been pierced through the heart, while still at least five yards from the writer by at least one Mauser automatic pistol bullet. The best stopping weapon we know of is a well-thrown, heavy sheath knife, but to be effective it must be thrown, as the writer has repeatedly seen it by an old side-partner, so as to insert about three inches of its blade through the ace of spades tacked to a post at about 20 yards, and as this requires a good deal of practice, we recommend you in the meantime to use the biggest-bore revolver you can get; the slowest-burning black powder makes a ball travel much faster than any man can rush at you, which is all you want. Use a double action (self-cocking) revolver by all means, but beyond that point, without depreciating improvements in mechanism, we have never been able to see the real advantage of automatic ejectors, top breaks and similar devices beyond convenience when at target practice. When you are in a really tight place and have used six cartridges, you won't have time to reload anyhow, however quick your automatic ejector, and you will have as much chance with the butt of a 20-year-old Colt with about 7½ inches of barrel, as with that of an up-to-date revolver with all the latest mechanical devices.

(10866) D. E. W. says: Will you please tell me if it is a fact that there is a total eclipse of the sun every 18 years and 10 days? A. Eclipses, solar and lunar alike, occur in a period of 18 years and 11 1-3 days, very nearly. It will be 10 1-3 days if there happen to have been five leap years in the period. No one knows when this fact was discovered, but it is certain that the Chaldeans knew it and predicted eclipses by its aid. About 70 eclipses occur in this period, varying somewhat because new eclipses come in at the eastern limit and old ones disappear at the western limit. The name of this period is the Saros. Of the 70 eclipses in a Saros, there are usually 29 lunar and 41 solar eclipses; and of the 41 solar eclipses, 10 are usually total.

(10867) F. B. asks: Why do not the equal days and nights occur when the sun crosses the celestial equator? For example, in one almanac calculated for latitude 40 deg. N., on March 21 last the sun entered Aries and spring began, but the nearest equal day occurred on March 18, three days before, while in September the nearest equal day occurs on September 27, four days after. A. Equal days and nights do occur every time the sun crosses the equator. The day is just twelve hours and the night twelve hours long. But because of the equation of time the clock time of sunrise and sunset varies from six. The true sun is east of the mean or clock sun by about seven minutes in March and a little more than seven minutes to the west in September. See any good textbook of astronomy for a full explanation of this. Todd's, price $1.75, or Young's "General Astronomy," price $3, are recommended and can be supplied by us. 2. What causes the synodic revolution of the nodes of the moon, and why does the line of apsides change? A. The synodic revolutions of the moon's line of apsides and the regression of the nodes of the moon's orbit are caused by the disturbing action of the sun upon the moon. The discussion of these effects constitutes the problem of the three bodies. A good elementary presentation of the problem may be found in Young's "General Astronomy."

(10868) P. Y. asks: Suppose recording maximum and minimum pressure gage is lowered below the disturbing influence of the waves, in the open sea, during a calm, what effect will the ebb and flow of the waves have on the gages during a storm, we will say at the time when the difference is 10 feet from the normal, or 20 feet from the crest to trough? A. A pressure gage under water will show the change of pressure due to change of depth of water. It can make no difference whether the depth changes because of a wave or because of a change of depth of the gage. If the water becomes ten feet deeper, the gage if sensitive enough will indicate that fact.

(10869) G. R. M. asks: Please answer through your paper the following questions: On a direct-current system a 16-candle-power incandescent lamp consumes ½ ampere current per hour at 110 volts = 55 watts. Does the same lamp operating on alternating current of the same voltage consume an equal amount current equal in both cases? Why do wires carrying alternating current heat if both are not placed in same iron conduit or not concentrically wound? A. A 55-watt 16-candle-power lamp uses 55 watts on any form of current on which it can be raised so as to give 16 candles. It uses a half ampere all the time, and 55 watt-hours per hour. Wires carrying any form of current are heated by the current, producing $0.24C^2Rt$ calories, in which C is amperes, R is ohms and t is the time in seconds. This cannot be avoided by any arrangement of the wires. It is the price in calories which must be paid to get a current over a line.

(10870) P. H. K. writes: Is ice formed from sea water salt or fresh? A claims that it is salt. B claims that it is impossible to have salted ice, as in the process of freezing the salt is eliminated. Who is right, A or B? A. When aqueous solutions freeze, the solids in solution tend to separate from the water, and the ice thus formed is pure or nearly so. It would not be easy to form a block of uniformly salted ice. This is sometimes expressed by saying that water freezes itself pure, which is not a very correct manner of stating what takes place. The water freezes molecule by molecule, and the solid in solution is separated from its solvent, the unfrozen portion of the solution becoming finally a saturated solution. B has the better of the argument.

(10871) H. L. S. says: Will you please inform me how to connect up an electric bath-tub? A. If the tub is of metal, connect one of the electrodes to the metal, while the other is held in the hand. If of porcelain, connect one electrode to a metal plate and place in the water.

(10872) M. M. asks: 1. If lightning strikes in a body of water where a man is swimming, will he feel it if it strikes within a hundred yards of him? A. We do not know any reason why a person should be affected by lightning striking the water in which he is swimming. The earth is at zero potential and is of infinite capacity, from which it follows that no amount of electricity can raise the electrification of the earth so that a man could be shocked by it when he is immersed in it. The case is the same as that of a man buried in the ground or in a cellar under the ground. No lightning stroke can harm him in either of these positions. Of course a man's head projecting above the water might be struck, but this is not the condition which you suppose. 2. Which will break first, a rope 5 feet long or a rope 100 feet long, if it has the same strength all over the rope and the same strength pulling it? A. If two ropes, one 5 feet long and the other 100 feet long, are pulled equally, the ropes being supported at the ends only, the longer rope will break first, since its weight is greater than that of the shorter rope, and is added to the pull upon it. If the ropes were lying on the ground or other support, we do not think the difference in length would make any difference in breaking strength, although we are aware that many hold the opposite opinion.

(10873) J. W. H. asks: Is there any difference in the strength of a magnet with a ¼-inch core and one with a ⅛-inch core if both are wound with the same amount of wire? Would it make any difference to the strength of a magnet having a ¼-inch core to have the core thinned down to ⅛ inch at the bending point? The reason for doing this is to make it easier to bend after the magnet is bound. A. The ease with which lines of magnetic force can pass through the core of an electromagnet is proportional to the sectional area of the core. For this reason a core ¼ inch in diameter will transmit four times as many lines as a core ⅛ inch in diameter, if all other conditions were the same. We should not advise the winding of an electromagnet and bending the core after the winding. It is much better to wind the coils on spools which will slide over the iron core and put them in place after the core has been bent into its final shape.

(10874) N. R. R. asks: Will you please let me know whether natural ice is colder than manufactured ice or not? The latter is made at a temperature of 20 degrees above zero, and natural ice undergoes a temperature sometimes many degrees colder. Does it retain this greater cold? A. All ice, natural or artificial, in any place below the freezing point will have the temperature of that place; in any place above the freezing point it will have the temperature of the freezing point. Ice does not retain its temperature below the freezing point. It cannot be heated above the freezing point, under ordinary circumstances. Like any other solid, ice is cooled in the winter to the temperature of the air, be it zero or below, and becomes warmer as the temperature rises till its melting point is reached. Then it cannot be made hotter. It changes its condition to the liquid form.

(10875) H. C. D. asks: Being a constant reader of your valuable paper, I take the liberty of asking you to kindly inform me through your Notes and Queries column whether the following statements which appear in the Encyclopædia Britannica (vol. xi, pages 66 and 67) are correct. Under the heading "Gravitation," paragraph 2, it says: "Movement of a Falling Body.—Our knowledge of the force of gravitation being ultimately founded on observation and experiment, it will be convenient at this point to describe the experiments by which a knowledge of the laws of motion of a falling body may be ascertained. We shall first describe these experiments, and then we shall discuss the laws to which we are conducted by their aid. A beginner is apt to be surprised when he is told that a heavy and a light body will fall to the ground in the same time if let drop from the same height. Yet nothing can be easier than to prove this important fact experimentally. Take a piece of cork *in one hand* and a bullet *in the other*, and drop these two objects at the same moment from the same height. They will reach the ground together. Nor will the results be different if we try a stone and a piece of wood." On page 67 it says: "The various experiments to which we have referred suffice to establish the very important result that the time occupied by a body in falling to the surface of the earth, if dropped from a point above it, is independent of the mass of the body as well as of the materials of which the body is composed." I always understood it to be a well-known fact that the velocity of falling bodies depends upon the specific gravity and the density of the medium through which they pass, and I am therefore at a loss to understand the meaning of the paragraph referred to. That the above paragraphs cannot possibly refer to bodies falling in a vacuum seems to be shown by the sentence: "Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height." A. The article which you quote from the Encyclopædia Britannica was written by Prof. Ball, Astronomer Royal of Ireland at the time he wrote it. It is hardly likely that he was in error on so simple a matter as the fall of a cork and a bullet from the hand to the ground. Have you tried it for yourself? Had you done so, you could hardly have written the letter to us. The experiment is simple. So are others given by Prof. Ball. Try them till you are convinced that it is the matter of the earth which draws bodies down to its surface, and that the rate of fall is not dependent upon the weight or the density of the body falling. This was demonstrated by Galileo at the Leaning Tower of Pisa before the immortal demonstration of the law of gravitation by Newton. The paragraphs you refer to have no dependence upon the other fact that the lightest and heaviest bodies fall alike in a vacuum. They refer to the fact that all moderately heavy bodies fall practically alike through the air. Very light things are retarded enough by the air to have their rate of fall changed by the resistance of the medium through which they are falling.

(10876) H. M. asks: 1. Why are the guns on battleships not larger than 45 caliber, 12-inch? Is it because they are strong enough, or because an ordinary ship is unable to carry larger guns? A. 45 calibers is found to be the maximum length which can be used to advantage for the 12-inch gun. The greater length would prove cumbersome, and necessitate larger turrets to accommodate the greater weight back of the trunnions. 2. By what formula is the displacement of ships known before they are launched? A. The displacement of ships is found by calculating the cubical bulk of the ship below the waterline. 3. Would it be possible to build torpedo boats of say 400 tons with a speed of 45 knots? A. In the present state of the art it would be impossible to build a hull of 400 tons displacement which would float horse-power necessary to give a speed of 45 knots. The "Viper," a torpedo boat of slightly over 400 tons, holds the record for speed of slightly over 36 knots an hour. The horse-power increases as more than the cube of the speed, and hence the weight of the engines to give a propeller thrust suitable for a speed of 45 knots would be altogether prohibitive. 4. a. A description of the 21-inch torpedo in use in the United States navy. A. The United States 21-inch torpedo was described in the SCIENTIFIC AMERICAN of January 6, 1906. b. A description of the 45-centimeter torpedo in use in the German navy. A. We are not aware that any data regarding the German 45-centimeter torpedo have been made public. 5. Is there any work giving complete statistics of all rapid-fire guns in use in the large navies? A. Brassey's Naval Annual gives full statistics. 6. Please put an article in your paper that treats of the new ships now building in England, i. e., "Dreadnought," armored cruiser "Orion," T. B. destroyer "Afridi," and the special type torpedo boat that is intended to make 36 knots per hour. A. The "Dreadnought" was illustrated and described in the issue of the SCIENTIFIC AMERICAN of August 25, 1906. We have no data respecting the other vessels mentioned.

(10877) E. R. asks: Will you please state in your query column how many revolutions the earth makes in 365 days? A. The earth makes 366 revolutions on its axis in 365 solar days. One rotation of the earth on its axis is completed when a star which was due south last night is to-night in the same position. Since the earth is also moving in an orbit around the sun, the star seems to reach the south point about four minutes earlier each night than it did the previous night. The earth must turn on its axis, about four minutes of time more to bring the sun to the same place day by day. This extra time constitutes the difference in length between the solar and the sidereal day, and in a year causes that there shall be one sidereal day more than there are solar days. There are 365 solar days and 366 sidereal days in each year. The sidereal day is the true measure of the rotation of the earth on its axis with reference to a star or to a fixed point in absolute space.

(10878) H. B. C. asks: 1. Why is it that a light, when put into a 110-volt circuit, will not short-circuit the current, while a piece of small copper wire of about the same length as the filament of the lamp, when placed in the same position, will immediately short-circuit? I have found it to be a fact that when an incandescent light's globe breaks, the filament does the same as the piece of copper wire, provided, of course, that the current is on. Do I not, therefore, have reason for thinking that the air has something to do with this? A. When the globe of an incandescent lamp breaks, the hot filament is instantly burned by the oxygen of the air just as any other piece of carbon would be. The current is not short-circuited by the filament. The flash of light which is seen is due to the chemical action of burning the filament, and not to any electrical action. When the circuit is bridged by a short copper wire, the resistance of the copper wire is small and a large flow of amperes takes place, which heats and melts and also burns the copper. This is what is meant by a "short circuit." 2. How may a small, practical, 110-volt current electric heater be made? Is not German silver wire the best for this purpose? A. If you want an electrical heater which may be attached to a lamp socket, wind about 200 to 220 ohms of fine German silver wire on porcelain tubes and mount in some convenient fashion. SUPPLEMENT 1112, price 10 cents, contains valuable data concerning electrical heaters. 3. What is the smallest size of wire allowed by the Fire Underwriters' Association for wiring building with 110-volt current? I have been using what is known as No. 14 rubber-covered for my outside, and No. 14 weather-proof for my inside wiring. In this am I meeting the requirements or not? A. No. 14 wire is allowed by the Underwriters to carry 12 amperes in rubber insulation, and 16 amperes in other insulations. 4. Do wires necessarily need to be soldered in joining them to make them more electrically and mechanically perfect? A. In good work wires are always soldered at junctions to other wires. No other connection is allowed.

(10879) J. C. B. says: 1. In what probable way does Edison expect to utilize cobalt? Can he use the chlorine gas from it as a motive power? If not, how to use it in storage batteries? A. We regret to say that we are not able to answer your inquiry, "In what probable way does Mr. Edison expect to utilize cobalt?" etc. It would be a hazardous thing to attempt to tell what Mr. Edison will probably do, or may be expected to do. We doubt if he tells any one, even if he knows himself, what he expects to do. We may say that there is no chlorine in cobalt, and no motive power in chlorine. We are sure that Mr. Edison does not expect to find either of these results in his investigations. 2. In ante-bellum days here in North Carolina, by rubbing a pocket knife blade across the *points* of the old flat strap iron on the railroad track, the blades of the knife so rubbed became highly magnetic, capable of lifting iron or steel objects of considerable weight, a fourpenny nail or larger perhaps. I have so done often myself, but after some forty years cannot say positively I raised anything heavier than a fourpenny nail. Have tried the present T-iron rail repeatedly, with *no magnetism resulting* at all. Why is this? The magnetic properties were then well known, but do not know if I can *now* establish the fact by another witness than myself. A. Any magnetizing of a knife by stroking it on a rail was due to the fact that the rail was a magnet. If the old experiment cannot now be repeated, it is because the present rail is not a magnet. 3. From what source does the ocean derive its intense saltiness, and how retain same in uniform strength? A. The salt now in the ocean has been in the past ages washed out of the land or dissolved from beds of salt in the earth to which the water gained access. The saltness remains, since all the water which evaporates from the ocean is fresh water. The original water was fresh. It became salt by dissolving salt from the earth. 4. Why are the conventional number of guns (21) fired in honor of the President of the United States? Is it by Congressional enactment? Why 21

and not 13 for original in thirteen States? A. The firing of 21 guns as a salute for the national flag, the President of this or other countries, or the sovereigns of foreign states, is an international custom.

(10880) M. W. and C. P. write: We would like to know, through the columns of your valuable paper, how a boiler of 15 horsepower, that is only in use about three months during a year, should be left. Should it be filled with water or empty, and should the smokestack be protected? A. A boiler to be laid up for a season should be thoroughly cleaned on the inside, filled with water with steam on, so as to be full of hot water that has been boiled, up to the safety valve. The flues and fire surface of the boiler should then be cleaned; ashes and soot removed from every part where such lodge. Then close fire doors, ash pit, and put a cap on the smokestack. With this treatment laid-up boilers do not rust inside or outside. It is the moist air drawn through a laid-up boiler that does damage by rust.

(10881) C. F. C. asks: 1. Are lantern slides (which are printed by contact) more sensitive to the light than carbon velox? For instance, a plate that printed a good clear picture on carbon velox in 15 seconds, being held 12 inches from a large size house lamp, would a lantern slide take longer or shorter time to print it? A. Lantern slide plates are always slow plates, much less sensitive than ordinary plates. A longer exposure is required. 2. Have you a SUPPLEMENT telling how to make lantern slides? A. We can send you "Photo-Miniature Lantern Slides," price twenty-five cents, and Elmendorf's "How to Make and Color Lantern Slides," price $1 by mail. We can send you SUPPLEMENT 483, 517, 724, 1062, 1082, on slide making, for ten cents each. 3. Also, how to make a lantern slide camera for making slides from 4 x 5 negatives? A. SUPPLEMENT 625 tells how to make a bellows for a camera to take 4 x 5 negatives, and in Elmendorf's book there is a chapter on working with a camera in slide making. 4. Is there a magic lantern made which takes standard slides and burns oil for the light? Is this done, and are the pictures clear when thrown on the screen? A. Yes. The pictures cannot be enlarged more than four feet in diameter with oil lamps since the light becomes so faint by diffusing it over so large a screen.

(10882) E. E. S. asks: 1. What is the best way to mount a map on a muslin backing, and would a window shade be suitable? A. Moisten the muslin, stretch and tack it down on a table. Then wet the map thoroughly and apply the paste evenly over the entire back of the map, being very careful to bring it to the edges of the paper. Now lay the sheet on the cloth and smooth it out and rub it down upon the cloth so as to remove air bubbles and bring it into contact with the cloth. A roller or squeegee such as is used for mounting photographs will enable you to do the job much better. 2. How can I produce on brass the bronze-like finish used on the instruments of surveyors and engineers? A. Bronzing of brass is effected by dipping in a solution of 5 drachms of perchloride of iron to 1 pint of water, until the desired color is obtained; then wash in hot water, dry, and lacquer with a thin shellac and alcohol varnish.

NEW BOOKS, ETC.

THE BUILDING MECHANICS' READY REFERENCE. Cement Workers' and Plasterers' Edition. By H. G. Richey, Superintendent of Construction of U. S. Public Buildings. New York: John Wiley & Sons. 16mo.; 458 pages, 193 illustrations. Price, $1.50.

Of the making of handbooks there is no end, but their multiplication is hardly more rapid than that of highly specialized branches of engineering construction; and, if we may judge from the number of inquiries received, not only from builders' mechanics but from architects and engineers, information on the lines of reinforced and other concrete work is less completely supplied than in other branches. This want Mr. Richey's latest work seems to very adequately supply; the mensuration and miscellaneous tables are as complete as in the earlier editions for other builders' mechanics, those for transmutation from one system of measurement to another being exceptionally so. The various hints and recipes and the rules for superintendence are most practical; and as regards tests, analyses, and specifications for cements, we cannot think of any practical detail upon which we desire information which we cannot find in these pages. That most essential feature of a useful handbook, the index, has received proper attention and the illustrations are excellent, coated paper having been used where required for the reproduction of photographic half-tones, the remainder of the book being printed on thin paper to reduce bulk and keep it within dimensions convenient for the pocket.

NOTES ON HYDROELECTRIC DEVELOPMENTS. By Preston Player. New York: McGraw Publishing Company, 1908. 16mo.; pp. 68. Price, $1.

The present book deals with the commercial aspect of an industry in which investors, capitalists, and bankers are much interested, as schemes for the utilization of water power are constantly coming to the fore. It is the object of this short discussion to indicate as

far as possible the information which should be obtained in order to afford a definite basis for forming a decision as to the merits of any proposed undertaking.

The Automobile Route Book. Compiled by D. H. Lewis. Automobile Route Book Company, 1907. 12mo.; pp. 192. Price, $1.50.

The present volume deals with routes which start from Buffalo, N. Y., and is therefore particularly valuable for automobile enthusiasts that live in the western part of the State of New York. The maps are excellent. There is also a list of automobile owners in Buffalo and nearby places.

Cyanide Processes. By E. B. Wilson, E.M. New York: John Wiley & Sons, 1908. 12mo.; pp. 249. Price, $1.50.

Owing to the recent improvements in cyanide practice, especially in the treatment of slime, the author adds a chapter giving the latest treatment, thus bringing the fourth edition up to date. Since the first edition, the volume of literature on the subject of cyaniding has increased twelve-fold (one-fold for each year), and while many theories have been proved and disapproved, there remains much to learn, although the process is an established metallurgical one. With the main facts, as outlined in this book, thoroughly digested, the metallurgist need not work haphazard, or the reader be mystified, and any investor must see an element of success in this as in any other undertaking. The details of plant construction are purposely omitted, since they vary at each mill and must be worked out by the engineer and performed by masons, carpenters, and millwrights. The detailed construction of machinery and apparatus is likewise omitted, as they are purchased from mill supply houses ready made and from designs that have been tested. By dealing with the subject in this manner a large mass of generalities is eliminated from the text, to the advantage of those seeking facts about the process rather than mechanical details.

House Painting, Glazing, Paper Hanging, and Whitewashing. By Alvah Horton Sabin, M.S. New York: John Wiley & Sons, 1908. 12mo.; pp. 121. Price, $1.

For every man, woman, and child in this country more than a gallon of paint is used every year; and the relative amount is increasing. Paint is a necessity; it is an economy; it is a means of sanitation; it helps us to keep clean; it keeps us warm in winter and dry in summer; it brings light into dark corners; it beautifies our homes; it increases our credit; it raises our assessments; the most ignorant enjoy its benefits; and the most highly developed minds, whose culture is so profound that they have forgotten all they ever learned at college, retain its appreciation. A subject so various in its uses, so universal in its appreciation, deserves attention—indeed, merits intelligent study. The book tells simply and plainly the use of preservative coatings of one sort and another for the protection and ornament of common houses, as they are known, or should be, to every one of the author's fellow-countrymen. An experience of many years in the manufacture and use of paints and varnishes is the foundation of the author's knowledge, and while on many points even experts disagree, the intention is to set forth fairly sound and safe practice.

Consumption. By N. S. Davis, A.M., M.D. Philadelphia: F. A. Davis Company, 1908. 12mo.; pp. 172. Price, $1.

Although this book has been reprinted many times since it was first issued, it has not been revised until the present time. When it was written the education of the public in regard to the nature of pulmonary tuberculosis, its prevention and management was just begun. To-day everyone knows much of these subjects. However, the need of an explanation of the ways of preventing it, and of guiding those who have it to recovery, is as great as ever. Every chapter has been rewritten, and an additional one has been incorporated upon the advantages and character of treatment in sanitaria and other institutions.

Electrical Contracting. By Louis J. Auerbacher. New York: The McGraw Publishing Company, 1908. 12mo.; pp. 155. Price, $2.

This volume was written for the wireman and contractor with a view to giving him not only some practical hints on the latest construction methods, but also to suggest to him means for increasing his income. Many special devices are described which will prove of great interest, such as a safety stop for a motor, picture reflectors, etc.

Wireless Telegraphy and Telephony Popularly Explained. By Walter W. Massie and Charles R. Underhill. New York: D. Van Nostrand Company, 1908. 12mo.; pp. 76. Price, $1.

An objection to the majority of books on wireless telegraphy, even though prepared for the layman or the younger students of wireless telegraphy, is that they begin with a history of the situation, including in the subject various forms of induction methods of communicating through space, which are apt to confuse the reader. This form of introduction is avoided in the present work. The subject is dealt with very simply, and the principle of wireless telegraphy and telephony is made clear by showing its analogy to the action of waves in water. The commoner forms of apparatus are described in a practical way. The book closes with a special article by Nicola Tesla on the future of the wireless art, which might better have been left out.

The Plane Table and its Use in Surveying. By W. H. Lovell. New York: McGraw Publishing Company, 1908. 18mo.; pp. 49. Price, $1.

The plane table, one of the oldest of surveying instruments, is in its simplest form merely a board for holding paper or other material upon which a map is drawn with the aid of a rule or straight edge. Although a useful and serviceable instrument for railroad and land surveyors, it has never come into general use in the United States. This may be explained, however, by lack of knowledge of the instrument, and its methods, as little has been written upon the subject. Of late years it has gradually become better known, and the present little treatise will tend to assist in the diffusion of knowledge relative to the plane table.

The Railroad Signal Dictionary. An Illustrated Vocabulary of Terms Which Designate American Railroad Signals, Their Parts, Attachments, and Details of Construction. With Descriptions of Methods of Operation and Some Illustrations of British Signals and Practice. First Edition. Compiled for the Railway Signal Association. By Braman B. Adams and Rodney Hitt, Associate Editors of the Railroad Gazette. Under the Supervision of the Following Committee: Mr. C. C. Anthony, Assistant Signal Engineer, Pennsylvania Railroad; Mr. Azel Ames, Jr., Signal Engineer, Electric Zone, New York Central and Hudson River Railroad; Mr. J. C. Mock, Electrical Engineer, Detroit River Tunnel Company. New York and Chicago: Railroad Age Gazette, 1908. Quarto; 3,127 illustrations; pp. 514.

The publishers of the present volume have previously issued a Car Builder's Dictionary and a Locomotive Dictionary of great value, and were therefore well equipped for undertaking the present work, which is the result of a discussion by the Railway Signal Association, the publication having been authorized by the Association. The present dictionary constitutes a complete encyclopedia of the signal systems, the apparatus and devices in use in the United States, and affords a very detailed explanation and covers the complete field in a most satisfactory manner. While primarily intended for signal engineers and other railroad men directly connected with signaling, the volume should be welcomed by patent experts and draftsmen and technical writers. The illustrations and descriptions cover manual block signaling apparatus, automatic block signals with their various appurtenances, and electric and electro-pneumatic and electro-gas apparatus for semaphore signals. The different track circuits are very clearly explained with diagrams of the tracks and the wiring; block signals for electric trolleys are given, and the standard manual interlocking machines and power interlocking machines. The various signals employed are explained in connection with diagrams of tracks indicating the practice at yards, junctions, terminals, and other situations. Different ways of working the block system are shown by diagrams. One of the authors, Mr. Adams, is especially well informed on all subjects relating to railway signaling from its beginning, while Mr. Hitt is an experienced technical lexicographer, so that the work not only elucidates the mechanical construction and actual operation of railway signaling, but affords an exceedingly desirable and authoritative terminology of the subject.

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Inquiry No. 8792.—For a firm that manufactures glass holders made of glass.

Inquiry No. 8794.—For manufacturers of the "Ideal Dust Pan."

Inquiry No. 8795.—For a mechanical device for catching or destroying flies, mosquitos, etc.; also traps for catching snakes.

Inquiry No. 8796.—For concerns manufacturing stills adapted to the manufacture of denatured alcohol.

Inquiry No. 8797.—For manufacturers of fiber.

Inquiry No. 8798.—For manufacturers of micro lens used in small articles such as pencils, charms, etc.

Inquiry No. 8799.—Wanted to buy new or second-hand box nailing machine for small packing cases.

Inquiry No. 8800.—Wanted complete data in regard to pegamoid.

Inquiry No. 8802.—Wanted to buy machinery for cutting and polishing oilstones, whitestones or grindstones.

Inquiry No. 8803.—For manufacturers of files, screws, druggists' supplies, hardware in general, and agricultural machinery.

Inquiry No. 8804.—For parties dealing in windmills, wood split pulleys, wheelbarrows, cutlery and picks.

Inquiry No. 8805.—Wanted to buy outfits and supplies for brazing.

Inquiry No. 8806.—For manufacturers of drawing materials.

Inquiry No. 8807.—For dealers in second-hand cotton machinery.

Inquiry No. 8808.—For manufacturers of machinery for making bungs for barrels.

Inquiry No. 8810.—For makers or importers of porous water bottles or jars to cool drinking water by evaporation.

Inquiry No. 8811.—Wanted to buy electric tattooing needles, inks and stencils.

Inquiry No. 8812.—Wanted to buy outfits for manufacturing fuel briquettes from sawdust.

Inquiry No. 8813.—For manufacturer of the "Steele" mixer for mixing food products, etc.

Inquiry No. 8814.—Wanted to buy hand lever air pumps, 100 lbs. pressure.

Inquiry No. 8815.—Wanted to buy carriage and wagon hardware coal, iron and steel.

Inquiry No. 8817.—For a firm that forms small articles of wire, also a firm to make wooden rings about 3 or 4 inches in diameter.

Inquiry No. 8818.—Wanted to buy specialties in large quantities.

Inquiry No. 8819.—For manufacturers of Excelsior Welding Compound.

Inquiry No. 8820.—Wanted to buy pressed fiber boards 1 foot wide and from 1-16 to ⅛ inch thick.

Inquiry No. 8821.—Wanted to buy machinery for making a rough composition board, something like a straw board.

Inquiry No. 8822.—For manufacturers of dredging machinery to be operated by gas engine.

Inquiry No. 8823.—For manufacturers of crepe paper and paper novelties.

Inquiry No. 8824.—For a firm to design and build an automatic machine for making finger shields.

Inquiry No. 8825.—For manufacturers of a new device to split wood.

Inquiry No. 8826.—Wanted to buy small fuel compression machines both manual and engine power.

Inquiry No. 8827.—For manufacturers of annealed glass.

Inquiry No. 8828.—Wanted to buy thin, highly tempered steel for safety razors.

Inquiry No. 8829.—Wanted to buy machinery for making pins, hair pins, hooks and eyes.

Inquiry No. 8830.—Wanted to buy machinery for making brushes and baskets.

Inquiry No. 8831.—Wanted to buy knitting machines.

Inquiry No. 8832.—Wanted addresses of high-grade label weavers, preferably in New York.

Inquiry No. 8833.—Wanted to buy a peanut shelling machine.

Inquiry No. 8834.—Wanted to buy a 2-horsepower gasoline engine for spray wagon working on hilly ground.

Inquiry No. 8835.—Wanted to buy toothpick machinery.

Inquiry No. 8836.—Wanted to buy decorticating machines for sisal.

Inquiry No. 8837.—Wanted to buy folding umbrellas.

Inquiry No. 8838.—Wanted to buy metallic targets similar to clay birds used in shot-gun shooting.

Inquiry No. 8839.—Wanted to buy cheap automobiles.

Inquiry No. 8840.—Wanted to buy portable hydrocarbon pressure lamps.

Inquiry No. 8841.—Wanted to buy lunch counter and restaurant fixtures.

Inquiry No. 8842.—Wanted to buy annealed glass.

Inquiry No. 8843.—Wanted to buy cigarette making machine.

Inquiry No. 8844.—Wanted to buy inkstands.

Inquiry No. 8845.—Wanted to buy mail order novelties, books, etc.

Inquiry No. 8846.—Wanted to buy an electric butcher band saw.

Inquiry No. 8847.—Wanted laundry tubs.

Inquiry No. 8848.—Wanted to buy rust proof metal for parts of wash tubs.

Inquiry No. 8849.—Wanted addresses of Canadian makers of rifle sights.

Inquiry No. 8850.—Wanted to buy machinery for making canvas gloves or mitts.

Inquiry No. 8851.—Wanted to buy machine for weaving wooden lath and wire together.

Inquiry No. 8852.—Wanted to have made a concave brass or copper reflector with focus of four or five feet.

Inquiry No. 8853.—Wanted to buy wafer safety razor blades.

Inquiry No. 8854.—Wanted to buy air compressor pressure up to 1,500 lbs., the capacity ranging 500 to 3,000 cubic feet.

Inquiry No. 8855.—Wanted machine to punch holes, feed and set automatically solid copper rivets and washers and rivet together harness done with one stroke.

Inquiry No. 8856.—Wanted a machine or grinder for reducing soft wood refuse to a fine dust.

Inquiry No. 8857.—Wanted addresses of shoe string manufacturers.

Inquiry No. 8858.—Wanted to buy comb cleaning machine.

Rail bond, C. A. Mead	899,120
Rail brace, W. H. Huffman	899,302
Rail chair, G. W. Sutherland	899,354
Rail fastening, H. K. Myers	899,230
Rail joint, H. C. Sandusky	899,190
Rail tie and fastener, J. M. Farra	899,390
Rails, device for preventing spreading of, C. L. McVoy	899,426
Railway cross tie lift, E. L. Barton	899,373
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Sawmill set works, A. A. De Loach	899,159
Seed, metabolism of, J. von der Kammer	899,306
Sewing machine for sewing straw plait, G. Fischer	899,392
Sewing machine needle, A. G. Bradley	899,381
Sewing machines, device for controlling the needle loop on overseaming, R. G. Woodward	899,479
Sewing machines, thread and sewing silk regulator for, M. Knapp	899,451
Shackle, padlock, F. Soley	899,268
Shade bracket, window, R. C. Loughner	899,116
Shaft, universally extensible tool, J. L. Steingasser	899,082
Sharpener, scissors, J. Fitzgerald	899,213
Sharpener, shears, E. H. Spafford	899,140
Sheet feeding mechanism, J. Ranz	899,133
Sheet metal frame construction, E. Ohnstrand	899,259
Sheller. See Peanut sheller.	
Shirt, L. F. Bowen, Jr.	899,154
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Shoes, arch supporter for, J. P. Naughton	899,182
Show case for displaying pickles and the like, D. W. Imus	899,052
Signaling system, S. Cabot ...... 899,239 to	899,242
Slimes separator, H. G. Nichols	899,428
Spacing machine, G. H. Dyer	899,294
Speculum, W. Meyer	899,175
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Stereotype plate casting apparatus, H. F. Bechman	899,374
Stirrup and spur, combined, Smither & Elder	899,344
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Stove, L. Miller	899,122
Stove base, J. Sharon	899,335
Stovepipe, L. C. Scott	899,135
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Superheater, J. H. Meissner	899,060
Superphosphate masses, apparatus for cutting up, F. Griesel	899,042
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Swingletree hook, C. C. Enders	899,104
Table, R. M. Sheehan	899,267
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Tiling, E. M. Kilbride	899,410
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Tire holder, spare, L. P. McKinney	899,126
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Tobacco pipe cleaner, D. Lossius	899,418
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Torpedoes, immersion regulator particularly adapted for, A. E. Jones	899,304
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Toy, S. Grobl	899,448
Toy or puzzle, R. D. Howell	899,402
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Traction wheel, G. Hohlencamp	899,047
Trap door operating mechanism, L. J. Berg	899,443
Trolley wheel, J. W. Seibert	899,474
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Turbine, Parsons & Stoney	899,319
Union suit, J. E. Richards	899,187
Valve, H. D. Snell	899,079
Valve, W. H. Kline, reissue	12,857
Valve, automatic air, G. D. Hoffman, 899,110,	899,111
Valve for flush tanks, supply, O. F. Glidden	899,486
Valve for hydraulic jacks, air, Nelson & Mathers	899,462
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Valve position controlling and indicator device, F. N. Connet	899,029
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Vehicle bodies, means for raising, A. J. Pack	899,430
Vehicle guiding means, L. S. Hackney	899,253
Vehicle running gear, M. W. Heyenga	899,218
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Vehicle wheel, W. H. Scrymgour	899,331
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Velocipede, ice, O. Pehrman	899,132
Vending machine, coin controlled, J. E. Allison	899,198
Vent pipe attachment, J. H. Brown	899,291
Wagon standard, W. W. Mullen	899,178
Washing machines, mechanical movement for, Brewster & Gibson	899,025
Washing sheet material, machine for, C. E. Moss	899,424
Water cooler, S. Holub	899,048
Water current motor, A. A. Porter	899,320
Water heater, Divekey & Genthner	899,388
Water motor, L. C. Lewis	899,058
Watering troughs, guard and cleaning attachment for stock, E. E. Norquist	899,129
Weather strip, F. A. Yeager	899,150
Weed burner, A. Iten	899,404
Well strainer, E. E. Johnson	899,054
Wheel. See Car wheel.	
Wheels of vehicles, non-skidding device for, H. H. Kenshole	899,056
Winding machine, Morrow & Foster	899,423
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SEALED PROPOSALS.

SEALED PROPOSALS will be received at the office of the Light-House Engineer, Tompkinsville, N. Y., until 1 o'clock P. M., Oct. 22, 1908, and then opened for furnishing one fourth-order lantern for Southwest Ledge Light-Station, New London Harbor, Conn., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to the Light-House Engineer, Tompkinsville, N. Y.

Wool, apparatus for extracting grease and potash salts from, F. & C. Shuman.... 899,440
Wool, extracting grease and potash salts from, F. & C. Shuman.... 899,339
Wrench, H. W. Allison 899,197
Wrench, A. L. Shaw 899,336

DESIGNS.

Automobile body, O. P. Fritchle.... 39,576
Badge or similar article, L. W. Pennington. 39,552
Barrette or hair fastener, G. R. Farrell.... 39,554
Belt, S. M. Riker 39,582, 39,583
Bracket, supporting, J. Kaiser 39,572
Clock case foot, R. A. Culver 39,563
Collar, lady's wire, M. V. Maag.... 39,580, 39,581
Cup, W. F. Rothermund.... 39,556
Game of five hundred, schedule card for the, W. B. Champlin 39,578
Gas burner, inverted, F. M. Brooks.... 39,567
Lamp, E. R. Estep 39,564
Lamp, Wohl & Hertzberg 39,565
Lamp pedestal, F. S. Verbeck 39,566
Lead and crayon holder, automatic, C. W. Boman 39,561
Mail box, C. H. Baldwin 39,569
Pencil case, E. Pearl 39,559
Pencil, propelling, H. Heymann 39,560
Pincushion, E. Daucher 39,579
Pipe holder, C. Elkin 39,558
Pipe trap, waste water, W. J. Frost.... 39,573
Printer's rule corner, W. C. F. Papke.... 39,562
Racks or drawers, front member for, D. B. Plunkett 39,570
Ring, W. E. Edwards 39,553
Shoe polishing machine casing, E. F. Stratton 39,571
Sign, druggists', R. A. Walter 39,568
Spoon, A. Atwood 39,555
Stove, vapor, Savage & Guterman 39,574
Tire, wheel, T. J. Mell.... 39,575
Tray, glass holding, O. Hebestreit.... 39,557

TRADE MARKS.

Absorbent cotton and gauze, and silk and catgut ligatures, Lister Surgical Co.... 70,693
Asphalt for road making and roofing, Sicilian Asphalt Paving Co. 70,675
Bread, Central Butter & Egg Co.... 70,688
Brushes, buffing and polishing, William Dixon Incorporated 70,682
Cakes and biscuits, R. van Hauen.... 70,696
Canned tomatoes, peaches, pears, etc., I. Levin 70,692
Castings, miscellaneous, Ohio Malleable Iron Co. 70,665
Clocks, American Cuckoo Clock Co.... 70,649
Cocks, Ohio Brass and Iron Manufacturing Co. 70,664
Collar supporters, Schloss-Speier Co.... 70,674
Cordial, lime juice, Evans Sons Lescher & Webb 70,689
Cornmeal, American Hominy Co. 70,685, 70,686
Cotton piece goods, Rice, Stix Dry Goods Co. 70,667
Creams, pastes, and powders, Cassebeer Pharmacal Co. 70,636
Cycles, motor, Hornbecker Motor Mfg. Co... 70,659
Dyes, G. Palmer 70,666
Flour, wheat, Waterloo & Cedar Falls Union Mill Co. 70,697
Food compound, certain, Genesee Pure Food Co. 70,690
Furniture, certain, Ford & Johnson Co.... 70,657
Garment hangers, A. Schlang 70,670, 70,673
Gin cocktails, G. Stiegler & Co.... 70,695
Gloves, kid, Steinberger & Kalisher.... 70,676
Insecticide, W. Peterman 70,644
Insulated electric wires and cables and insulating tape, W. R. Brixey.... 70,652
Lamps, incandescent electric, Sunbeam Incandescent Lamp Co. 70,679
Lamps, miners', G. Anton 70,650
Lenses, spectacles, and eyeglasses, D. B. Rubin 70,668
Lime, M. J. Grove Lime Co. 70,660
Magazine, Vulcan Steam Shovel Co.... 70,681
Magazine periodical, Business Magazine Co.. 70,653
Medicinal oil, H. Claus 70,637
Medicinal oil, National Remedy Co....70,641, 70,642
Needles, toilet and safety pins, O. Mustad & Son 70,662
Oil, Italian olive, Parodi, Erminio & Co.... 70,694
Organs, Estey Organ Co. 70,655
Oysters, J. & J. W. Elsworth Co.... 70,691
Pencils, automatic lead, E. Moster & Co.... 70,661
Pencils, lead, Styles & Cash 70,677, 70,678
Pianos, Estey Piano Co. 70,656
Purgatives, Knoll & Co. 70,640
Remedies for relief of pain, lameness, and soreness, J. A. Begy 70,635
Remedies for the ailments of live stock, Nebraska Live Stock Remedy Co.... 70,643
Remedy for intestinal indigestion, etc., Henry K. Wampole & Co. 70,639
Rings, finger, A. Constantine 70,654
Salve, T. M. Sayman 70,645
Shoes, cloth, rubber, and leather, National Shoemakers 70,663
Shoes, leather, Ainsworth Shoe Co.... 70,684
Soaps, E. Wertheimer & Cie 70,646, 70,648
Teeth, devices used in filling and treating, C. M. Beam 70,651
Tires, inner tubes of elastic, Goodyear Tire & Rubber Co. 70,658
Tobacco, smoking, Rural Tobacco Co.... 70,669
Varnishes, japans, lacquers, and enamels, Cleveland Varnish Co. 70,638
Whiskies, blend of straight rye, A. M. Jordan Co. 70,683
Wines, J. Calvet & Co. 70,687
Wire, hat, B. Trosky 70,680

LABELS.

"All Nations' Brand," for coffee, Globe Coffee & Molasses Co. 14,364
"Another Biscuit," for soda crackers, American Pastry & M'f'g. Co. 14,369, 14,370
"Apple Jelly," for apple jelly, Atlas Preserving Co. 14,368
"Buttercup Brand," for sterilized unsweetened condensed milk, Williamette Valley Condensed Milk Co. 14,366
"Calendar," for tea, George Lewis & Co., Incorporated 14,365
"China-Lac," for a varnish stain, Phoenix Color Works 14,372
"Contrivo," for cigars, Alhambra Cigar Co.. 14,350
"Fir Balsam, Product of Maine," for fir balsam, F. S. Huntley.... 14,371
"Frutil," for carbonated apple juice, Klammer Bros. 14,367
"Proxy," for a non-intoxicating beverage made from malt and hops, Schwarzenbach Brewing Co. 14,363
"Sanitary Hairnet," for hair nets, J. Kalmbach, Jr. 14,373
"Tulip A.," for cigars, American Lithographic Co. 14,360
"Tulip B.," for cigars, American Lithographic Co. 14,361
"Universo," for cigars, Schmidt & Co.... 14,362

PRINTS.

"Babihood Clothes," for infants' apparel, Windsor-Knitting Mills 2,349
"Ideal Cover," for covers, F. C. Roberts.... 2,348
"The Clothes for Fall 1908," for men's fall apparel, David Adler & Sons Clothing Co. 2,350
"The Dawson Taste," for straight Scotch whisky, Gunning System 2,346
"The Lucky Key," for bottled beer, F. J. Cooper 2,347

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

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